Heating Piping & Air Conditioning

DECEMBER 1955

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INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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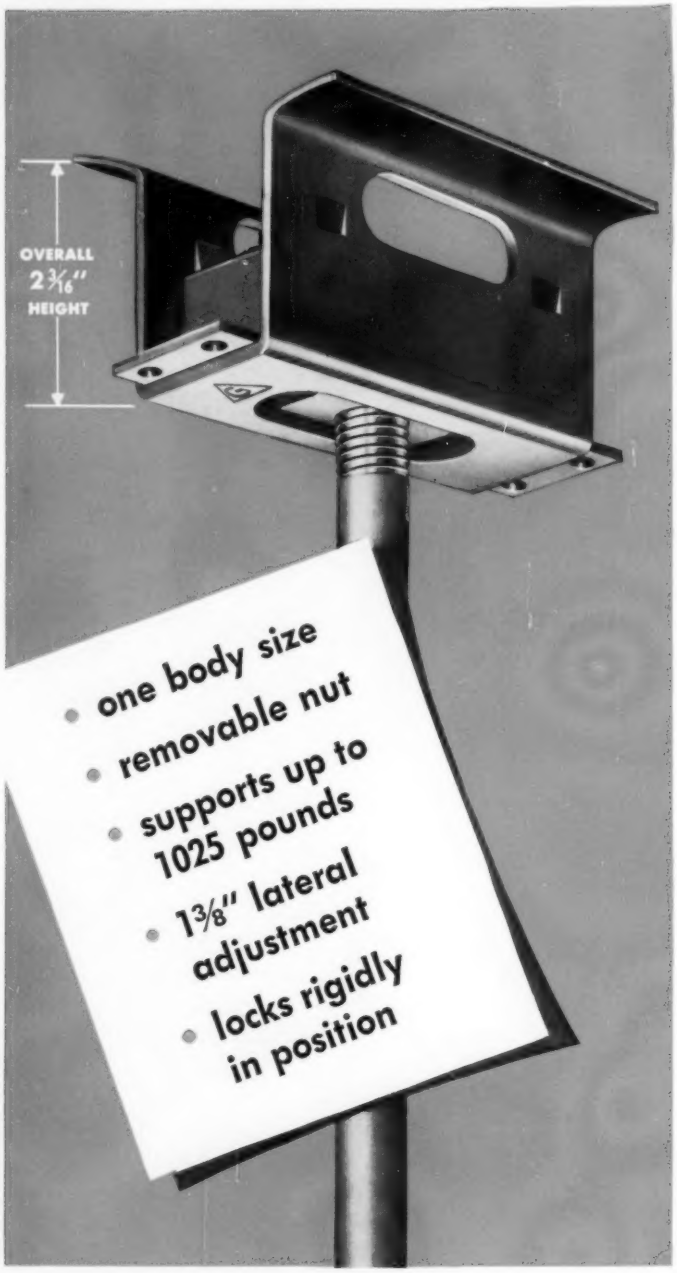
The new GRINNELL Wrought Steel CONCRETE INSERT



The newly designed Grinnell Wrought Steel Concrete Insert (fig. 280) is the economical answer to many overhead pipe suspension problems. It is made of heavy gauge steel and made to facilitate the use of various rod sizes. With but a single body size, manufacturing costs are reduced, ordering is easier, and installation simplified. This can mean a saving of time, trouble, and money for you.

The Grinnell Wrought Steel Concrete Insert is recessed to accommodate a special removable nut which is furnished with a 3/8, 1/2, 5/8 or 3/4 inch tapping. Once the rod or bolt is screwed tight, the nut is rigidly locked in place. Before tightening, the rod position may be adjusted laterally as much as 1 3/8 inches.

Thin-slab construction presents no problem. Overall height of insert, minus rod, is only 2 3/16 inches. The top edges are bent outward for solid anchoring. Slots in the sides will pass reinforcing rods up to 1/2 inch in diameter. With a load rating of 1025 pounds per unit (610 pounds for 3/8 inch rods), Grinnell's Wrought Steel Concrete Insert is rugged and inexpensive.

GRINNELL

AMERICA'S No. 1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Available from your local distributor

Grinnell Company, Inc., Providence, Rhode Island

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

Unusual year 'round air conditioning system uses

radiant panels plus air handling unit to effect significant operating economies

An unusual combination of air conditioning and ceiling heating and cooling coils has been installed in the new 25,000 square foot AAA Building in Kalamazoo, Michigan, headquarters building of the Detroit Automobile Inter-Insurance Exchange and the Automobile Club of Michigan. The building has 2 floors and a basement.

Providing the benefits of the two types of heating and cooling, the system uses ceiling coils to circulate hot water for winter radiant heating, chilled water for summer cooling. In conjunction with this, a 30-ton USAIRCO dual circuit self-contained central station unit (RK) provides conditioned, cooled or heated air for the two main floors. The factory balanced and tested RK, saves 95% of water consumption costs because of its built-in evaporative condenser.

The dual system provides an evenness of heating and cooling, and significant economies in operation. And in contrast to the completely radiant system, it also circulates fresh, tempered and filtered air of the right humidity throughout the offices.

In the summer, a USAIRCO 25-ton packaged chiller cools water for the radiant system. Water temperature is kept above the dew point to prevent sweating of pipe coils. In winter, hot water is similarly run through the system and to a coil in the USAIRCO RK unit to heat the conditioned air.

Architect
Louis C. Kingscotts and Associates

Mechanical Contractor
Miller-Davis Plumbing and Heating Company

Refrigeration Contractor
Tony's Refrigeration

Electrical Installation
Sanderson Electric Company

All are of Kalamazoo, Michigan

for descriptive literature on RK's write R. L. McClain

UNITED STATES AIR CONDITIONING CORPORATION

MINNEAPOLIS 14, MINNESOTA • *Export: 13 E. 40th St., N. Y. 16, N. Y., U.S.A.*

USAIRCO
10 YEARS OF AIR CONDITIONING

Pacific Telephone & Telegraph Company used

WROUGHT IRON PIPE for this Radiant Heating System

This radiant heating system, serving 22,500 square feet of floor area in Pacific Telephone & Telegraph Company's new warehouse at San Leandro, California, is an excellent example of the Company's insistence on durability. More than 16,300 feet of corrosion-resistant wrought iron pipe was used to safeguard the system against premature failure and costly repair.

The system, planned and designed by PT&T's Engineering Department, features some interesting construction details employed to protect the floor against damage from heavy fork-lift trucks and impact caused by bouncing reels of cable. After the 10-inch structural slab was poured, wrought iron pipe coils were laid in place. Over the pipe coils, a wire mesh was stretched to strengthen the concrete "topping" slab, and contribute to more even heat distribution. Then the pipe and mesh were covered with 3 inches of concrete. A metallic floor hardener was applied to the surface.

Architects for the project were Thomsen & Wilson, San Francisco. The system was designed by Harry S. Haley, San Francisco Consulting Engineer, in collaboration with Pacific Telephone & Telegraph Company engineers. The installation was made by Scott Co., Bay Area Mechanical Contractors.

Wrought iron pipe is ideally suited for this service because of its ease of installation, dependability in service. It takes short radius bends, without springback. It produces sound welds, free from pin-hole leaks. Its uniform structure assures sharp, full-depth threads. And because of its mechanical strength, wrought iron pipe withstands damage during installation. In service, wrought iron stays on the job longer, costs less per year.

Our bulletin, *Wrought Iron Pipe for Radiant Heating*, gives complete details, documents service records. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y.

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WROUGHT IRON

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ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 27 No. 12

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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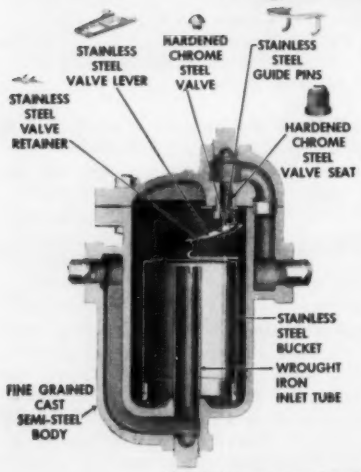
Companions for 11 years at 5 psig, 7" Hg. . . .

Armstrong Trap Maintenance: 2¼¢ per year


STAINLESS STEEL VALVE LEVER
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HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY

● This low pressure heating system trap has same design, materials and workmanship as traps for 900 lb. pressure, 900° F. jobs.

No wonder it lasts so long!

If you are responsible for a low pressure, vacuum return heating system, installation or operation, new or old, can you confidently expect steam trap repair parts costs anywhere near as low as 2¼¢ per trap per year over an 11 year period? That's the service record of over 100 Armstrong inverted bucket steam traps on a 5 lb. steam pressure, 7" vacuum return heating system at Globe Steel Tubes Company, Milwaukee, Wisconsin. It is not an unusual record for Armstrong traps, either. But, repair parts are the small item.

It pays to take a good, long look at steam trapping from three points of view:

1. Trap Maintenance — how much time and nuisance and cost is, or will be, involved in keeping traps operating properly, especially after they are a few years old. Time and again maintenance of Armstrongs has proved to be a fraction of that of the traps they replaced.

2. Holding Vacuum—biggest source of trouble is leaky steam traps! Have you read the article "Flash at Traps" by T. M. Reynolds. If not send for a free copy. It proves that leaks, not flash, are the problem.

3. Heat—how fast can you heat up a cold system and how much heat can you get out of it? Armstrongs discharge condensate at steam temperature as fast as it reaches the trap. And plenty of air handling capacity is built right into the trap. You get fast heat and maintain maximum temperatures all the time.

You have nothing to lose by talking it over with your local Armstrong Representative — remember he sells the traps that are *unconditionally guaranteed to satisfy the user* or the purchase price is refunded. Call him today or write Armstrong Machine Works, 874 Maple St., Three Rivers, Michigan.

Application Engineered

ARMSTRONG STEAM TRAPS

Free "Steam Trap Book"

44 pages of trap data, prices, selection, installation and maintenance information on trapping low, medium and high pressure lines and equipment. Send for it today — no obligation.

Don't forget to ask for the article "Flash at Traps"

TWENTY-FOOT LENGTHS of 10" I.D. copper tubes receive final inspection in one of the mills of The American Brass Company. ANACONDA Seamless Drawn Copper Tubes are made up to 26" I.D.

Anaconda Copper Tubes install easier ... last longer

Planning a new installation? Want to replace unsatisfactory piping? Then look into the performance advantages of ANACONDA Copper Tubes *first*. Many plants have found them the best all-around piping material available.

Here's why: ANACONDA Copper Tubes are light. They come in long lengths. Smaller sizes are bent right on the job. All this means big savings on installation costs. And copper tubes can't rust. They resist corrosion and guard against contamination. Smooth interiors mean smoother flow. Pumping costs are often lower.

Here's another advantage. ANACONDA Copper Tubes – connected with solder-type fittings – can be taken down, moved or have new connections cut in faster than with threaded pipe. *You can meet changing plant conditions easily.*

If we can be of assistance in solving a piping problem in your plant please write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ont.*

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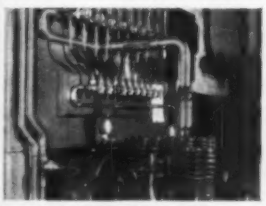
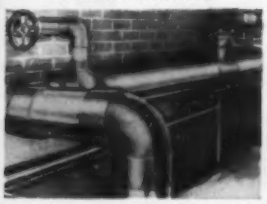
Use Anaconda Copper Tubes for:

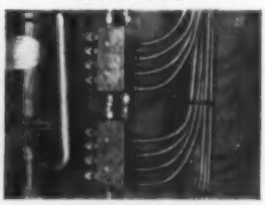


REFRIGERATION AND AIR CONDITIONING

HOT AND COLD WATER SUPPLY LINES



INDUSTRIAL HEATING LINES



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for copper piping call an

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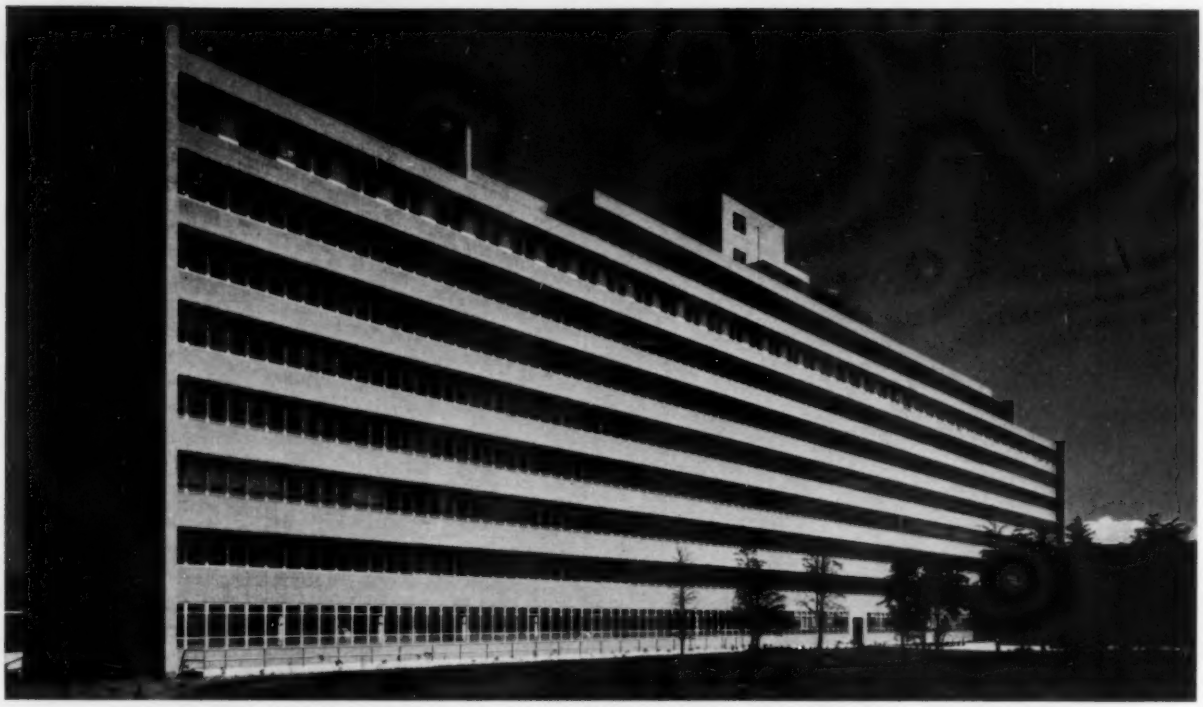

Veteran's Hospital, Seattle, Washington. *Equipped with B&G Pumps.* Architects: *Naramore, Bain, Brady and Johanson, Seattle.* Engineers: *Bouillon and Griffith, Seattle.*

For heating or cooling water

For all-year comfort conditioning, the advantages of water have made it the preferred medium. The quality of the equipment used to heat, cool, and circulate water, therefore, becomes of major importance to the designing engineer.

B&G presents a line of equipment specifically designed to meet the exacting requirements of a satisfactory water system. The B&G Universal Pump, for example, with *noise and vibration engineered out*... velvet-smooth in operation. For cooling, the B&G Package Liquid Cooler offers a completely integrated unit, alive with features for more economical performance, easier installation. And for the many applications where water-to-water or steam-to-water heat transfer is required, B&G Heat Exchangers provide large capacity in compact, efficient units.

If you haven't a complete file of B&G literature on heating and cooling equipment, write today. Remember, too, that the B&G engineering staff is always available for consultation.

BELL & GOSSETT
COMPANY
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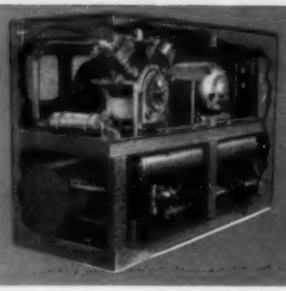
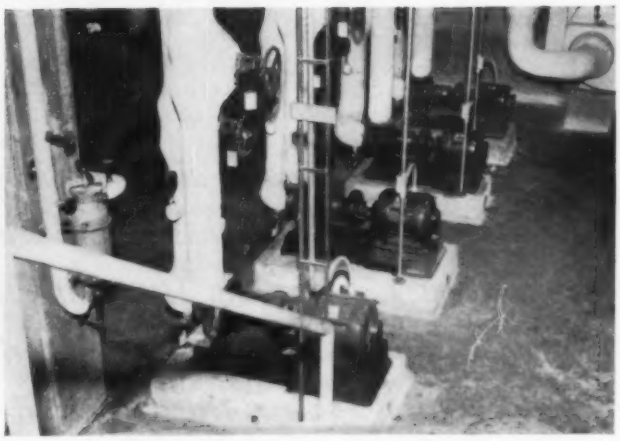


B&G Package Liquid Cooler
An engineering achievement which challenges comparison! Built in capacities from 3 to 100 tons, these units incorporate many special features as standard equipment. Completely self-contained... virtually a plug-in unit. Send for Bulletin HB-755.

B&G Type "WU" Heat Exchanger
An extremely versatile, instantaneous water heater with a wide range of applications. It is equipped with a B&G Booster Pump, which circulates boiler water through the shell under thermostatic control. Pumped circulation plus efficient internal design, enables a comparatively small unit to produce a large volume of hot water.



● **Apartment Building, Chicago, Illinois** (*upper left*). *Quiet B&G Universal Pumps are used to boost city water pressure.*

● **Illinois Institute of Technology faculty apartments, Chicago** (*lower left*). *Equipped with B&G Universal Pumps and Heat Exchangers.* **Architects:** *Mies van der Rohe, Pace Associates, Associated, Chicago.* **Heating Contractor:** *Wm. A. Pope Co., Chicago.*

● **Combination heating-cooling system** (*above*). *B&G Universal Pumps circulate heated and cooled water through the same piping system.*

and circulating it ***Noiselessly***

B&G Universal Pumps

In every detail designed and built for *silent, vibrationless* operation!

The motor is specially constructed, tested and *hand-picked* for quietness. Sleeve bearings in both pump and motor...suspension in ring-type rubber mountings and flexible spring couplers, all contribute to velvet-smooth performance.

Other features include the diamond-hard, leak-proof "Remite" Seal, oil lubrication and hydraulically balanced impeller. The removable bearing frame permits servicing without breaking pipe connections—*all the advantages of split case design!*

B&G Boosters

Famed for quietness—for efficiency—for long life! B&G Boosters are offered in a wide range of sizes for applications requiring less head and capacity than provided by B&G Universal Pumps. Widely used for residential heating, snow melting systems, circulating service water and as secondary pumping units in larger installations. *Over 2,000,000 B&G Boosters have been sold to date!*

Most promising word in air conditioning control today is electronics. Electronics has brought new techniques, new terms, new questions. ***How important is outdoor compensation? Is automatic sequencing practical for buildings of any size? What about averaging?*** *Here are the answers—in the first of a series of reports from the pioneer manufacturer of electronic controls.*

Electronic Temperature Control

More than 5,000 Honeywell installations have shown electronics to be the most flexible system for any commercial building; it gives better control, more convenience, at less cost.

Honeywell Electronics
Report Number One

HONEYWELL built the first electronic thermostat only half a dozen years ago.

Since then, electronics has become the most exciting concept in the field of commercial heating, ventilating and air conditioning control. The mystery is gone: more than 5,000 working installations by Honeywell alone are proving the value of electronic temperature control to engineers, architects and building management from coast to coast.

You'll find the up-to-date story of electronic control profitable to know—because there's plenty of evidence that electronics is rapidly setting a new standard in the industry.

Developers of the electronic thermostat were looking for better temperature control. They found it—in a small coil of wire that held the means of sensing and correcting temperature change quickly and accurately, without bulk, without clumsy linkages or moving parts.

New facts came to light when these controls were actually put to use. They not only proved to be faster, simpler, easier to maintain. They also were able to do a complete comfort control job in ways ordinary controls couldn't begin to match. And they saved money.

You can now assure a client that where applicable, electronic controls will deliver maximum comfort with maximum convenience, efficiency, and economy.

What are advantages?

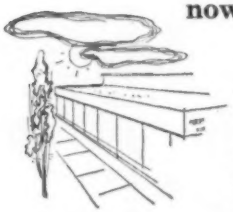
What is there about electronic control that makes such benefits possible? Considering specific advantages of electronics will help provide the answer. It may also suggest solutions to some of your own control problems.

Central Control heads the list of these advantages. The electronic central control panel, set up anywhere within the building, provides a compact supervisory control center from which every vital function of the control installation is directed. Gone is the need for individual thermostat checking and calibration; all adjustments may be made *at the panel.*

comes of age

What this means in terms of savings in manpower and maintenance is obvious. What's more, the panel also eliminates that flaw in many a control system, thermostat tampering by untrained personnel. The central electronic control panel is most at home, of course, in large buildings. But the simplicity of electronics now makes the panel economically feasible even for small structures.

Automatic sequencing now 100% practical



Any air conditioning control system benefits tremendously from automatic change-over from heating to cooling, and from automatic use of outside air to carry part of the cooling load. Now, electronics makes automatic sequencing practical for any job, large or small. It's convenient: the *same* thermostat may sequence from heating to full ventilation to mechanical cooling. It's effective: it utilizes the thermostat's full operating range. It's economical: automatic ventilation economizer cycle, built in, cuts cooling costs impressively; night set-back saves fuel.

With electronics, use of *averaging* thermostats—while no substitute for adequate zoning—is no longer costly and complicated. In controlling an open area as a single zone, for example, it's simple to locate inexpensive electronic thermostats so that load changes peculiar to the enclosure's equipment or occupancy are sensed and averaged out, maintaining a constant comfort level.

Ideal compensation achieved

Electronic controls are essential to the kind of compensation that means *consistent* comfort levels in any building. Shifts in occupancy; variations of wind, sun and cloud effects; sudden changes in outdoor temperature—all are compensated for with greater speed, accuracy and stability through electronics. Automatic winter-summer reset, utilizing an outdoor thermostat, cures temperature drift in winter, air-cooling shock in summer. Which means that comfort conditions inside never change with the weather.

Simplicity is inherent in electronic controls; no specialist is needed for installing or servicing. Wiring is low voltage, with standard color coding—easily understood by any heating and air conditioning technician. Today's installations will be up-to-date for many years to come. Maintenance and equipment aging problems are minimized, because the electronic thermostat contains no moving parts.

Key word: flexibility

These advantages are summed up in one word: *flexibility.* It means that all or any combination of the electronic system's features are readily adaptable to the solution of specialized control problems. The result is better, more efficient, more convenient control, and with important dollar savings.

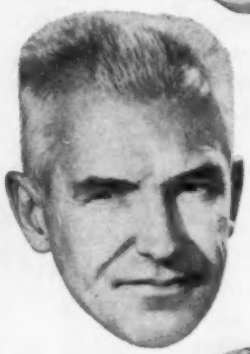
In fact, it's *flexibility*—in the entire field of temperature control — that helps establish clearly Honeywell's leadership. For only Honeywell makes *all three types* of control systems: pneumatic, electric, electronic, each with distinctive advantages for certain applications. Thus only Honeywell is able, with complete objectivity, to help you select the one system shaped perfectly to the needs of the building and its occupants.

• • •

Ask for our new electronic control booklet which tells more fully how to apply electronics to your control problems. Write Honeywell Dept. HA-12-149, Minneapolis 8, Minn.

Minneapolis-Honeywell Regulator Company

"I've never seen a sheet take every bend and roll without the coating flaking—but SOFTITE did it!"



"Fastening collars on straight boots is real severe. No sheet has ever been able to take it—but SOFTITE did it!"

"At last a sheet that can take a Pittsburgh Lock without chipping or flaking—and SOFTITE did it!"

"We've never had a sheet that combined a ductile base with a real tight zinc coating—but SOFTITE did it!"

...they all said it couldn't be done–but

WHEELING SOFTITE®

galvanized sheets did it!

Ever since Wheeling SOFTITE Cop-R-Loy Galvanized Sheets were first introduced, metal workers have been torturing the sheet with every known test and operation. And the results are consistently the same – no flaking or peeling of coating.

That's because SOFTITE combines a soft, ductile base metal with the tightest zinc coating yet produced. So tight, in fact, that the coating will take anything that the base metal will!

Put SOFTITE to any test. See for yourself why the demand for SOFTITE has forced Wheeling to triple its production facilities in 1955. Try SOFTITE once and you'll see why actual users call Wheeling SOFTITE the best galvanized sheet yet produced.

For details call the nearest Wheeling warehouse or office.

Wheeling also manufactures a complete line of Galvanized Furnace Pipe, snap lock or closed seam Perimeter Heating or Air Conditioning Pipe, and accessories.

Wheeling CORRUGATING COMPANY

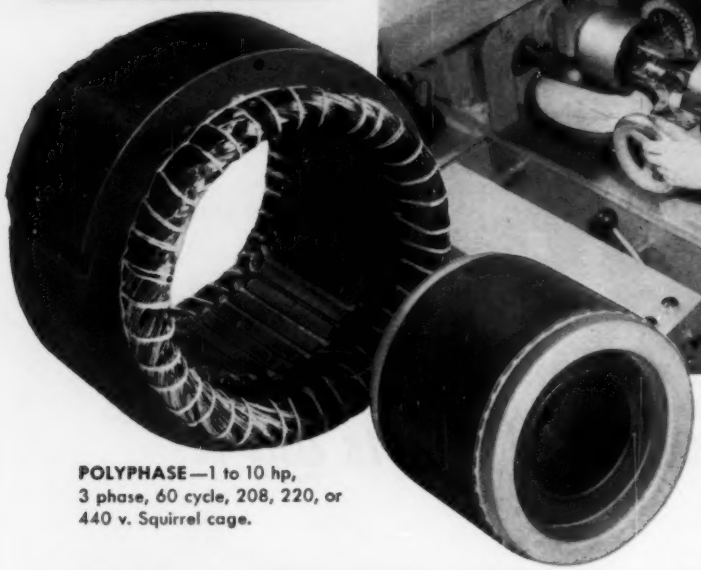
WHEELING CORRUGATING COMPANY, WHEELING, WEST VIRGINIA

For your convenience, warehouse stock immediately available at these locations: Boston, Buffalo, Chicago, Columbus, Detroit, Kansas City, Louisville, Minneapolis, New Orleans, New York, Philadelphia, Richmond, St. Louis. Sales Offices: Atlanta, Houston.

Galvanized steel does it better... SOFTITE does it best!

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

This photograph shows one of the stator winding machines used on Wagner's hermetic motor production lines. These machines, especially designed by Wagner engineers, are part of Wagner's modern motor production facilities.



POLYPHASE—1 to 10 hp, 3 phase, 60 cycle, 208, 220, or 440 v. Squirrel cage.

Wagner Hermetic Motors...built to give you better sealed-unit performance

SINGLE-PHASE
¼ to 5 hp, 60 cycle, 115 or 230 v. Split-Phase, Capacitor-start induction run, Capacitor-start and run.

When you design or build a refrigeration condensing unit that is to be hermetically sealed—*choose your motor drive with care.* Remember, it's your product that the user blames if the motor fails. But, if you use a Wagner motor, our reputation is at stake, too.

For that reason, we can't be satisfied to make just another hermetic motor . . . we can't be satisfied to merely meet industry standards.

That's why only the newest and best production tools available anywhere are used on Wagner's hermetic motor assembly lines.

That's why repetitive surge tests and dielectric tests are given to *every* Wagner hermetic motor stator. And that's why every rotor that goes into a Wagner hermetic motor is given an individual speed test. It's this exacting kind of quality control that contributes to the long service life of each Wagner hermetic motor.

When your motor drives are to be hermetically sealed, it's to your advantage to specify *Wagner* for use on your equipment. Get the facts . . . call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U. S. A.

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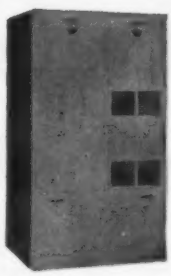
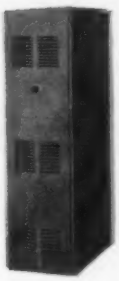
M55-15

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS–AIR AND HYDRAULIC



HEATING—
COOLING
COMBINATIONS



COUNTERFLOW
FORCED AIR
FURNACES

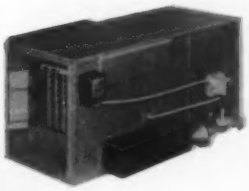
$martest line
you've ever $een
WEATHERAMIC
in bank note green

Who's lucky? You! Why? Because now you can offer your customers all the superior engineering you expect from Utility, plus the sales appeal of color.

This good-looking Weatheramic series in Bank Note Green brings you good luck you can cash in on. Utility patented Blowers and Sy-lent* Heat Exchangers are yours to sell with confidence in the Weatheramic series. Utility's high efficiency, trouble-free operation and truly functional design will continue to help build your good reputation with every sale.

Sell Weatheramic for customer satisfaction.

VERTICAL
FORCED AIR
FURNACES



HORIZONTAL
FORCED AIR
FURNACES

Weatheramic LINE

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UTILITY furnaces air coolers air conditioners water heaters

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Trane Fans and Coils have more features that give you

Greater efficiency . . . compactness in your built-up

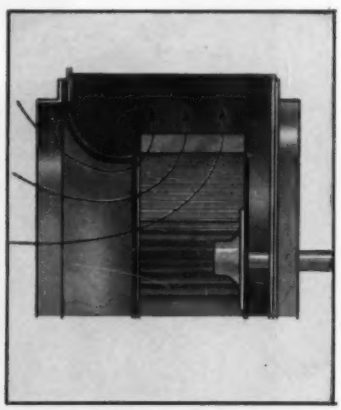
Handle bigger jobs with more compact equipment . . . get greater reliability, too!

The efficiency features of TRANE Fans and Coils can make a *big* difference in your built-up systems! For example, the TRANE Delta-Flo Fin and mechanical fin-to-tube bond not only give you a more *efficient* coil, but actually form a stronger, more rigid unit than heretofore possible. And even that is only part of the story.

TRANE Centrifugal Fans available in BI types in all sizes through 109", FC types through 89". Utility fans 4" through 30". Propeller fans 10" through 48".

Compare Trane with any other fans

- **True non-overloading** power characteristics, moderate rotative speeds.
- **Special housing** and outlet shapes handle large volumes with minimum noise, high efficiency.
- **Air-streamed hub** and back plate assembly eliminates eddying and shock.
- **Fan wheel balanced** dynamically and statically with electronic balancing equipment.
- **Rugged housing** of lock-seam construction (small fans), welded construction (large fans) resists damage.
- **Proved performance** backed by over a quarter of a century of fan building experience.



Streamlined inlet cone distributes air evenly in fan wheel without noisy turbulence. Permits fan to operate at high efficiency with low noise level.

one source • one responsibility

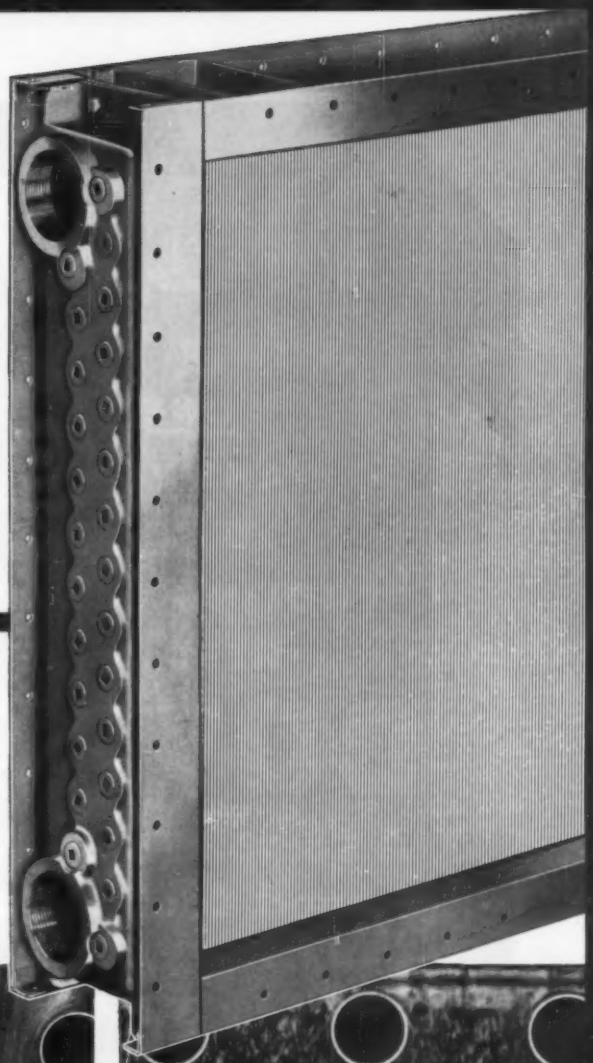
Install

MANUFACTURING ENGINEERS

The Trane Company,

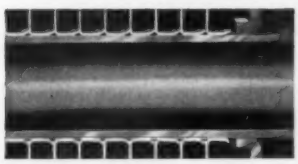
durability... systems

Every TRANE feature—from the accurately streamlined fan inlet to the exclusive kinetic orifice—has been *proved in actual application*. You know you can count on TRANE Fans and Coils for efficiency, durability and compactness *before* you order! For details see your nearest TRANE Sales Office or write TRANE, La Crosse, Wis.

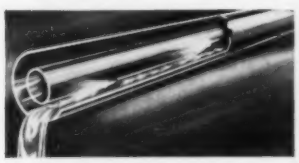


Compare Trane with any other coils

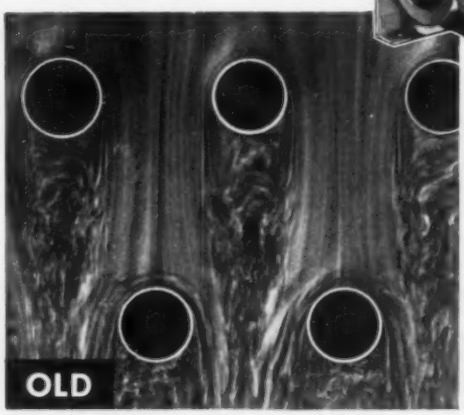
- **Accurate ratings** proved by over twenty-five years of field and laboratory testing.
- **Exclusive dual fin** contact assures high heat transfer, greater strength.
- **Greater rigidity** assured by the formed delta ridge of the new Delta-Flo Fin.
- **Low air friction** of plate type fin offers minimum air resistance.
- **High coil capacity** yet wide fin spacing.
- **25% more effective** use of the fin surface.
- **More uniform heat** transfer over entire surface of the fin.



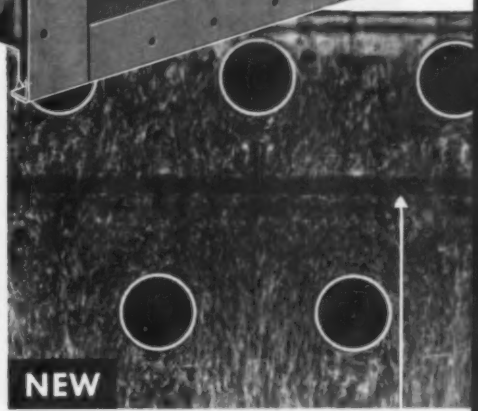
Mechanical fin-to-tube bond is as strong as though fin and tube were one. Wide, flat collar forms generous heat transfer area.



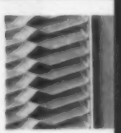
Kinetic orifice on SD coils releases steam in the direction of the condensate flow. Accelerates condensate flow, guards against freezing, provides more uniform temperature distribution on modulated control.



Old plate fin. With flat fin design, turbulence is concentrated behind each tube as shown by this unretouched laboratory test photo. Since turbulence is concentrated, a large part of the fin area produces little heat transfer.



New Delta-Flo Fin. Delta-shaped ridge just ahead of each row of tubes extends turbulence over *entire fin surface* for uniform-heat transfer. Unretouched test photo shows how every inch of fin surface contributes to heat transfer.



TRANE **Fans and Coils** *for efficient built-up systems*

OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

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NOW

THERE IS ONE ANSWER TO ANY COOLING TOWER NEED . . .

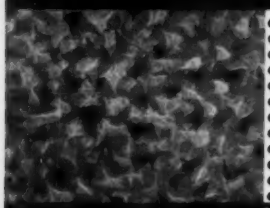
DOVER

A Complete Line of Packaged Cooling Towers

Whatever your cooling tower requirements there's one answer — one simple solution — a Dover packaged cooling tower. Now, Dover has a complete line of quality cooling towers to meet your needs for any type of installation.

What's more, you know that you can depend on Dover for the finest quality, the finest workmanship, the greatest performance. And what about the price? You'll find that Dover towers are priced among the lowest in the industry; yet when you consider the extra features you get only in a Dover tower, they are actually less expensive than any other.

THESE IMPORTANT EXTRAS COST YOU NOTHING IN A DOVER TOWER

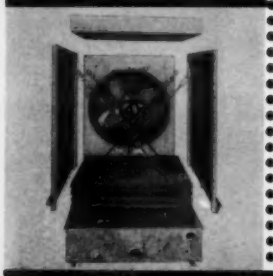


HOT-DIP GALVANIZING— After Fabrication

All metal parts of Dover towers are hot-dip galvanized after fabrication. This rugged finish is standard on Dover towers . . . eliminates costly rust problems.

STAINLESS STEEL FAN BLADES

In every Dover horizontal induced draft tower you will find stainless steel propeller fans. These fans are built to last. This distinctive Dover feature means that troublesome fan failures are eliminated.



DOVER "TAKE APART" FEATURE

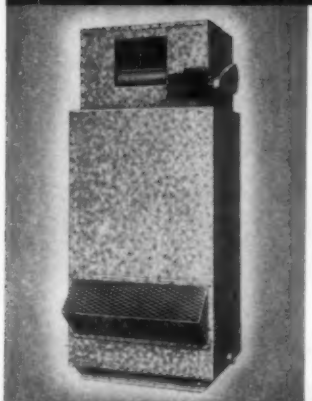
Because Dover towers are built on an exclusive bolt-free construction principle, your Dover tower can be rapidly disassembled and assembled again right on the job where "hard to reach" basement or roof-top installations are desirable. Adjustable tie-rods are the secret of this Dover feature.

DOVER . . . AMERICA'S NEW STANDARD FOR PACKAGED COOLING TOWERS

DOVER

to bring you
A COMPLETE LINE OF QUALITY COOLING TOWERS at A COMPETITIVE PRICE!

VERTICAL INDUCED-DRAFT TOWER with Centrifugal Blower

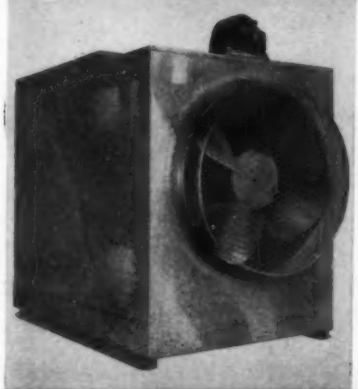


The ideal tower for those installations where space is a factor. Completely flexible and easily adaptable in its use, this tower can be used anywhere in the building. Placed next to the condenser, piping is held to a minimum. Super-quiet operation means it can be placed in a room close to workers without annoyance. When used with duct work, it will remove warm, objectionable air from the building and, at the same time, ventilate the room that it is in. Because air intake and outlet are on the same side, this tower can be placed flush with the wall.

You'll find these additional features only on a Dover tower — exclusive spray distribution system to every inch of deck surface for greater efficiency — life-time decking of asbestos fibre-cement board — and, of course, Dover hot-dip galvanizing — easy maintenance of blower and drive assembly — rugged, bolt-free construction.

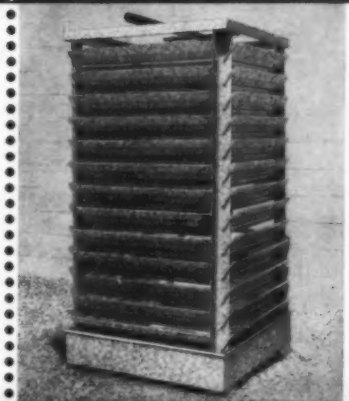
This Series V tower comes in capacities from 5 to 100 tons.

HORIZONTAL INDUCED-DRAFT TOWER with Propeller Fan



This Series CF tower has become the new standard of the industry. Its neat, modern design is an integral part of the rugged long-life construction. Designed for trouble-free performance, this Dover packaged tower will serve any needs from 2 to 100 tons capacity at an extremely low operating cost. Completely hot-dip galvanized, it is ideally suited for small air conditioning and refrigeration installations and for jacket water or air compressor cooling.

AT LAST! AN ALL-STEEL NATURAL DRAFT TOWER



Here at last is the ideal natural draft tower . . . all steel to meet the strictest municipal fire codes . . . galvanized throughout for long life and attractive roof-top appearance . . . virtually bolt-free in design for rapid field assembly . . . new-type plastic spray nozzles provide better performance over conventional design. More good news! Dover Series K all-steel towers cost little more than wood towers and are available in sizes from 3 to 100 tons. Also available in Series S—the same tower but with all-heart redwood louvers and corner posts.

FREE! LITERATURE ON THE DOVER LINE

Have some questions about these Dover towers? We have some answers that you're sure to like—and they are yours absolutely free and without any obligation. We'd like to send you full information on how Dover can be the answer to your cooling tower needs. Won't you take us up on this offer?

HERE ARE JUST A FEW OF THE MANY SATISFIED DOVER USERS

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WHY WAIT? LET DOVER BE THE ANSWER TO YOUR COOLING TOWER NEEDS!

MAIL THIS COUPON TODAY!

DOVER MANUFACTURING COMPANY
Dept. 100, 3117 Weatherford Avenue
Independence, Missouri

☐ Please send me more information on Dover Packaged Cooling Towers.

☐ Send me the name of my nearest Dover representative.

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CITY _____ ZONE _____ STATE _____

DOVER . . . AMERICA'S NEW STANDARD FOR PACKAGED COOLING TOWERS

illinois

FLOAT AND THERMOSTATIC TRAPS

SERIES G • FOR LOW PRESSURE STEAM SERVICE

Assure *lower* return line temperatures

They're different!

–in construction
–in performance

Recommended Applications . . .

Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Process Heaters, Hot Water Generators, Drips of Mains and Risers.

Illinois Float and Thermostatic traps operate under vacuum with the same high efficiency as under pressure. No more water-logging in mains...no more air pockets...put an end to "morning overload" troubles. The condensate control valve provides complete and instantaneous drainage of condensate while a separate thermostatically controlled valve in cover vents air in large volume, yet prevents loss of valuable steam.

The condensate valve is actuated by impact when the float drops—a snap action that is independent of the rate of flow of the condensate. Valve is not directly attached to the float and is either tightly closed or wide open. This instantaneous operation makes wire drawing impossible.

Illinois traps, because of their unique valve action, function perfectly at all load conditions, with lower return line temperatures than ordinary type traps. Lower return line temperatures assure higher vacuum pump efficiency. Straight through connections save head room, fittings, labor. Trap is easily opened for inspection. It is not damaged by freezing. Sizes from ¾ inch to 2 inches.

Write for Bulletin

ILLINOIS ENGINEERING COMPANY

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DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

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Free! Valuable New Folders!

Ask your wholesaler for new folder on "*Genetron*" Super-Dry Refrigerants. Contains pressure-temperature charts and other helpful information.

No Matter Where You Are

There's a* genetron *Wholesaler Near You!

Coast-to-coast, America's leading Refrigeration and Air Conditioning Wholesalers feature "*Genetron*" *Super-Dry Refrigerants.* There's one as near to you as your telephone ready to supply you with complete stocks of "*Genetrons*" and with up-to-the-minute data on their uses.

Remember—"*Genetron*" *Refrigerants* are super-dry! Their moisture content is exceptionally low; their over-all purity, extremely high. They meet the industry's most exacting refrigerant specifications . . . are freely interchangeable with comparable fluorinated hydrocarbon refrigerants produced by any other manufacturer. Follow the industry-wide trend to Super-Dry "*Genetrons.*" Insist on "*Genetrons*" when buying refrigerants.

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GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

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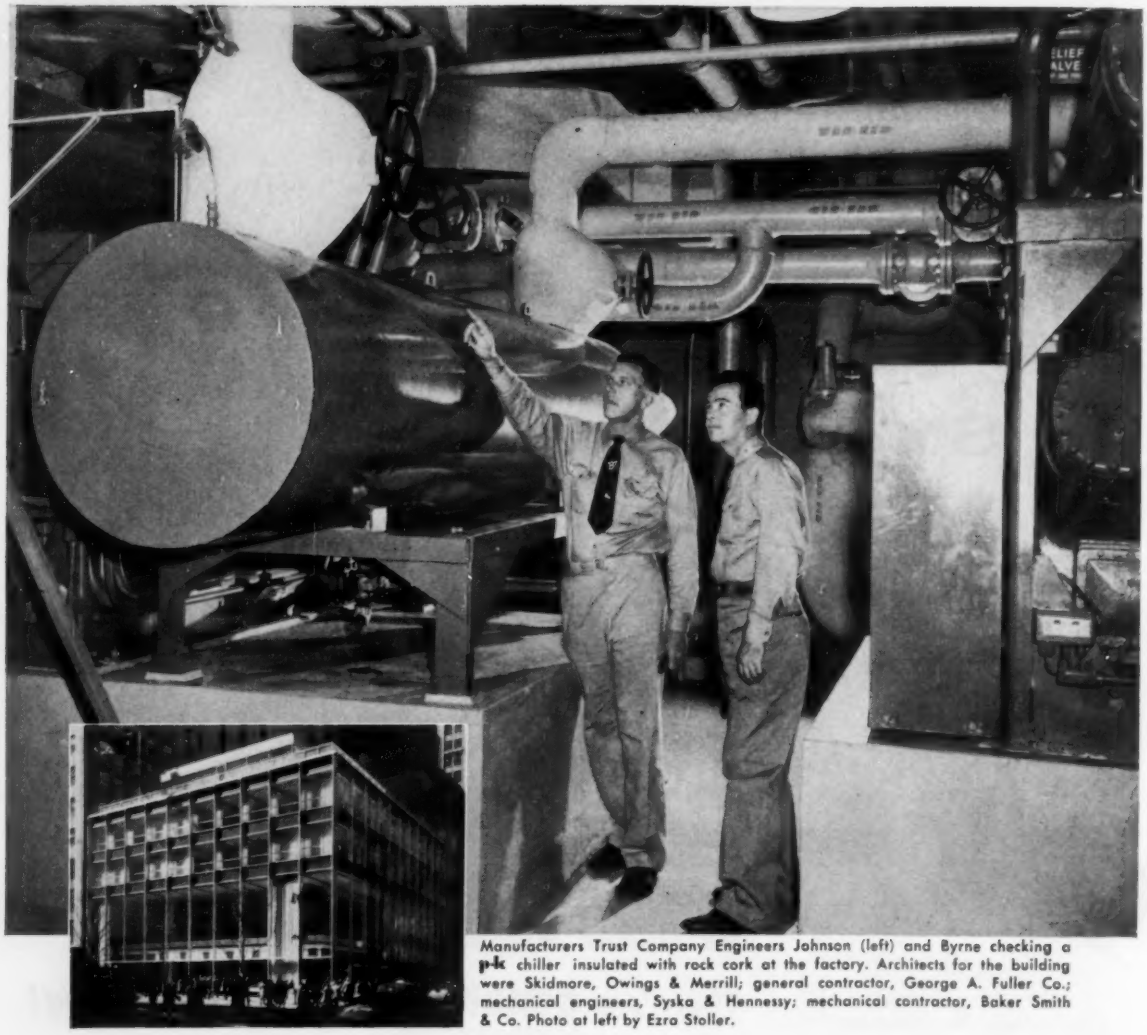
Offices in principal cities

GC Allied Chemical



Manufacturers Trust Company Engineers Johnson (left) and Byrne checking a p-k chiller insulated with rock cork at the factory. Architects for the building were Skidmore, Owings & Merrill; general contractor, George A. Fuller Co.; mechanical engineers, Syska & Hennessy; mechanical contractor, Baker Smith & Co. Photo at left by Ezra Stoller.

Worthington relies on p-k chillers in the world's most distinctive bank building

When this "house of glass" opened at the corner of Fifth Ave. and 43rd Street in New York last year, 40,000 visitors came to take a look. Small wonder! For in this newest and largest branch of Manufacturers Trust Company, they saw architectural history being made.

No longer are bank tellers "caged." Customers transact their business in a new atmosphere of space, light and friendliness.

Contributing to this feeling of unhurried friendliness are two 150-ton Worthington air conditioning units, each equipped with a p-k dry expansion Freon chiller. This super-efficient system "reconditions" all five stories of the building every three to five minutes with 97,000 cu. ft. of fresh, low-humidity, 74 F air. It's automatic, too, shutting down by itself at 11 P.M. and starting again at 6 A.M., to assure a comfortable working climate for the bank's 280 employees – and their customers – at the start of each day.

Teamed up with Worthington's famous "million dollar" compressors, p-k chillers each supply blowers with 331 gallons of water per minute, chilled from 50 F to 40 F.

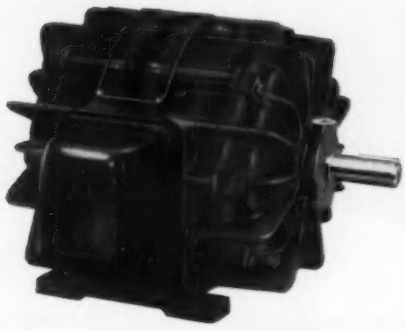
For full information on these complete units write Worthington Corp., Dept. PK, Harrison, N. J. today. Or write for Catalog 101 on p-k chillers to The Patterson-Kelley Co., Inc., 820 Burson Street, East Stroudsburg, Pa., and principal cities.

PATTERSON-KELLEY

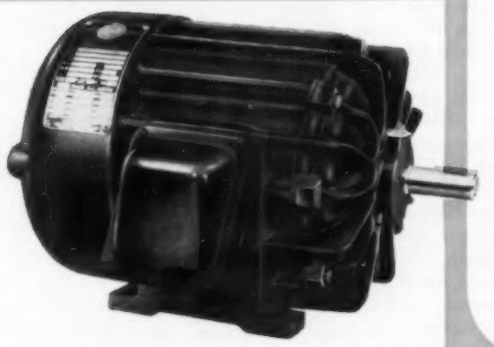
2579

Flooded and Dry Expansion Type Freon Coolers and Storage Water Coolers • Freon Condensers • Allied Refrigeration and Air Conditioning Equipment

DUST-PROOF!
MOISTURE-PROOF!



Type "DIE" Motor (Not Fan-Cooled)



Type "DIP" Motor (Fan-Cooled)

TWO NEW "DIEHL MOTORS FOR *Air-Over-Motor*" APPLICATIONS

Tops in Quality — Competitive in price!

When you buy or specify motors for fans, blowers, unit heaters, air conditioners, cooling towers or dehumidifying systems *don't overlook* these two new standard or custom-designed Diehl Totally-Enclosed Motors.

Smaller in size, lighter in weight, precision-engineered and precision-built to new NEMA standards, they are ideally suited to "air-over-motor" applications where moisture, fumes, dust and other airborne particles are a problem ... a field in which Diehl has long been a leader.

Diehl

Tops in Quality—
Competitive in price!

DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins:

☐ New Type "D" Motor Bulletin No. HP-3304
☐ Consolidated Catalog & Price List No. HP-3310

Name_____
Company_____
Street_____
City_____ State_____

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

The General Controls address..

IT seems to us here at General Controls that this is an especially appropriate time of year to express a genuine thanks to our many friends and customers who have figured so prominently in the success of our company over the years. And we intend to express this thanks more tangibly in the coming year with products and service which will continue to make *your* business more profitable.

To further this goal, General Controls purchased the Controls Division of the Perfex Corporation this last year. This move adds the widely accepted Perfex oil burner and electric controls to our line, and augments our service and manufacturing facilities considerably. We now have 40 branch offices throughout the United States and Canada, 7 warehouses, and 5 operating plants—including the two most recently acquired in Iron Mountain, Michigan, and Guelph, Canada.

The box score for 1955: the nation's most *complete* line of automatic controls, backed by the best in design, manufacturing, and sales facilities. All near-at-hand... all at *your* service.

Once again, our sincere thanks and best wishes.

Cordially,

Jack F. Ray

J. F. RAY
Vice President
In Charge of Sales

A Complete Line

- ONE SOURCE
- ONE RESPONSIBILITY

For every automatic control need

FOR MANUFACTURERS: A dependable, completely reliable source of supply from a company which pioneered such major control advances as the B-60 self-powered gas control system, and custom color styling in water heater controls. A complete line for all standard applications...specialized design and engineering help also available upon request.

FOR JOBBERS: The on-call assistance of one of the nation's largest factory trained field service organizations to support the jobber's daily program of dealer development, training, and servicing—in addition to providing the convenience of local inventories for emergency demands.

FOR DEALERS: A superior product line backed by 25 years of experience in the field to guarantee against costly call-backs and servicing that cut dealer profits...plus General Controls' continuing national and regional advertising which gives the dealer product acceptance that *moves merchandise.*

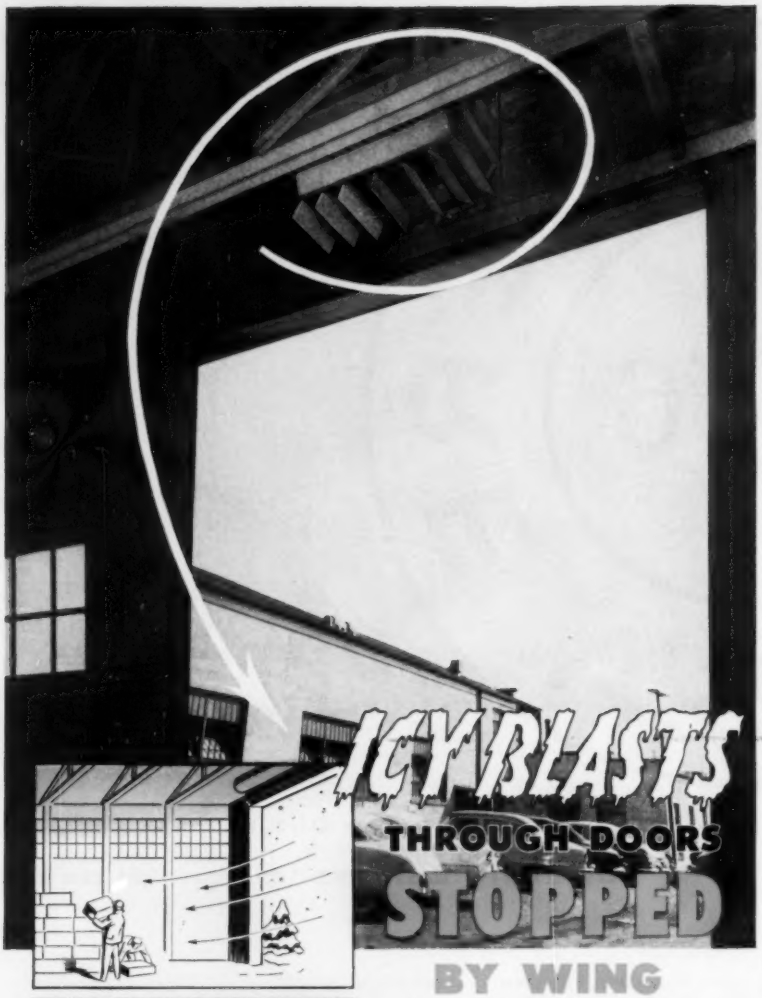
GENERAL CONTROLS

MANUFACTURERS OF AUTOMATIC CONTROLS FOR HOME, INDUSTRY AND THE MILITARY

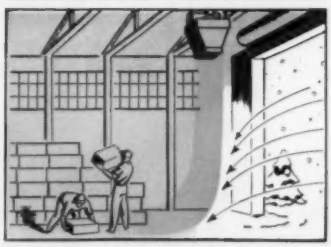
GENERAL CONTROLS • PERFEX CONTROLS

40 FACTORY BRANCH OFFICES SERVING THE UNITED STATES AND CANADA

FIVE PLANTS: IRON MOUNTAIN, MICHIGAN • GLENDALE, CALIFORNIA • BURBANK, CALIFORNIA • SKOKIE, ILLINOIS • GUELPH, CANADA



ICY BLASTS THROUGH DOORS STOPPED BY WING DOOR HEATERS



A curtain of warm air is projected downward, preventing the icy blasts from entering.

They go into action as soon as the doors are opened, putting a curtain of warm air between the cold outside and the inside of the building, preventing the chilling blasts from entering. Workers stay healthy, are happier and keep right on working with the doors open. Learn how easily Wing Door Heaters can be installed in *your* plant. Send coupon for bulletin.

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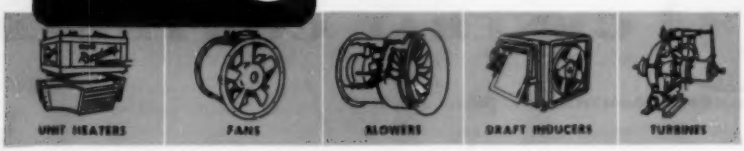
Address.....
City.....Zone...State.....



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In most cases if a process steam system is large enough for heating in winter, it can be used economically to provide air conditioning in the summer, because the increased steam load costs less per pound than the part load for process alone. A C. H. Wheeler Steam Jet Ejector system becomes most economical when air conditioning requirements exceed 100 tons. By means of this system water is chilled to as low as 50-55°F. with steam pressure of 50 psi or over. C. H. Wheeler has always led in the development of the steam jet ejector and its application to industrial refrigerating requirements. We invite your correspondence.

(Catalog 1462 is available.)

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WE-509

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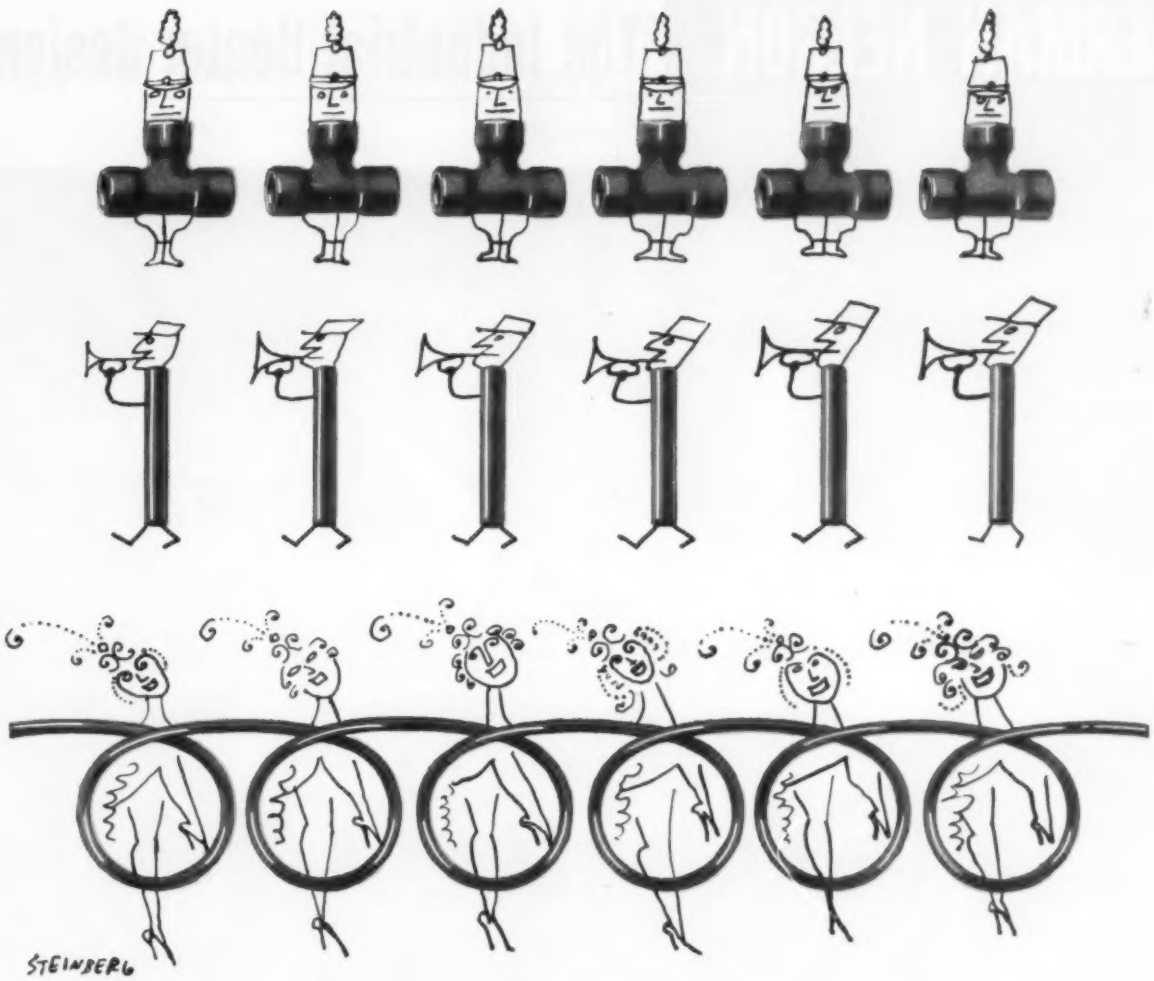
19TH AND LEHIGH AVE., PHILADELPHIA 32, PA.



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To maintain our precision standards, we control and check each manufacturing step—from raw material to packaged product—in our own *completely integrated* plant.

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COPPER AND BRASS TUBE, PIPE, ROD AND FITTINGS

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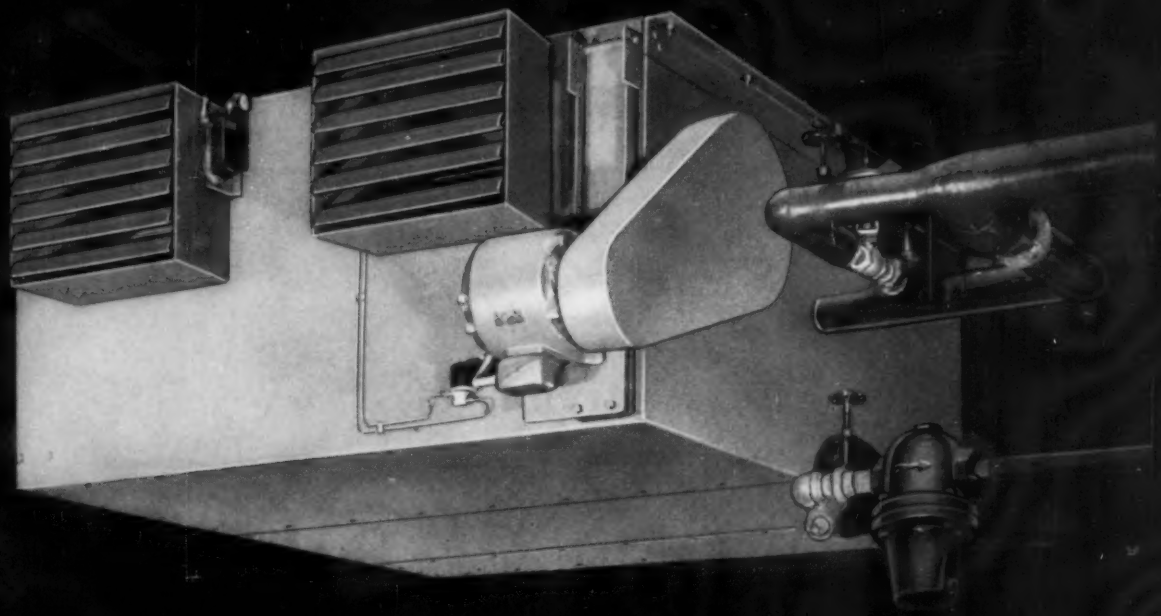
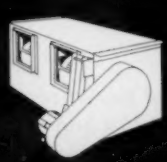
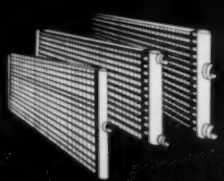
The Industrial Heater designed

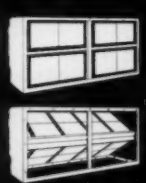




WIDE CHOICE OF FAN SECTIONS

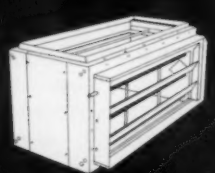


MANY RADIATOR TYPES AND CAPACITIES



CHOICE OF FILTER SECTIONS

HUMIDIFIER — IF DESIRED



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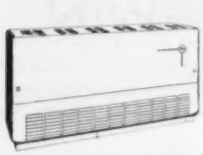
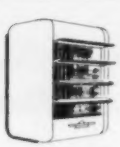
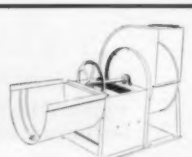




HERMAN NELSON UNIT HEATERS



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Use the versatile Herman Nelson Industrial Heater not only for comfort heating and ventilating in your plant . . . use it also for process drying, curing, air cleaning and other special heating-drying-ventilating needs. Use it for heating vast areas or small quarters, for directing heat at doorways or work areas. Install it anywhere—on wall, ceiling or floor—with or without ducts. Its big capacity does the job of many smaller, propeller-type units. Choose from heat capacities ranging to one million BTU's.

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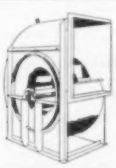
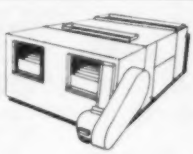


CENTRIFUGAL FANS



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AAF — Herman Nelson

your one source for products that clean, heat and move AIR

ELECTRO-CELL with Type H Washer—high efficiency air cleaning with pushbutton maintenance—the washer as an integral part of the unit simplifies installation.

ROTO-CLONE Self-Contained Units offer a simple solution for such isolated dust problems as this grinder stand. Exhaust air is filtered and returned to workroom.

PORTABLE HEATERS being used to spot extra heat around workmen in a welding shop. Models available from 75,000 to 450,000 BTU. Oil or gasoline fired. Electric or gasoline powered.

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Please send me complete information on the following American Air Filter/Herman Nelson equipment:

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- ☐ UNIT BLOWERS
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- ☐ PORTABLE HEATER
- ☐ STEAM SPECIALTIES
- ☐ _____

NAME _____

FIRM NAME _____ POSITION _____

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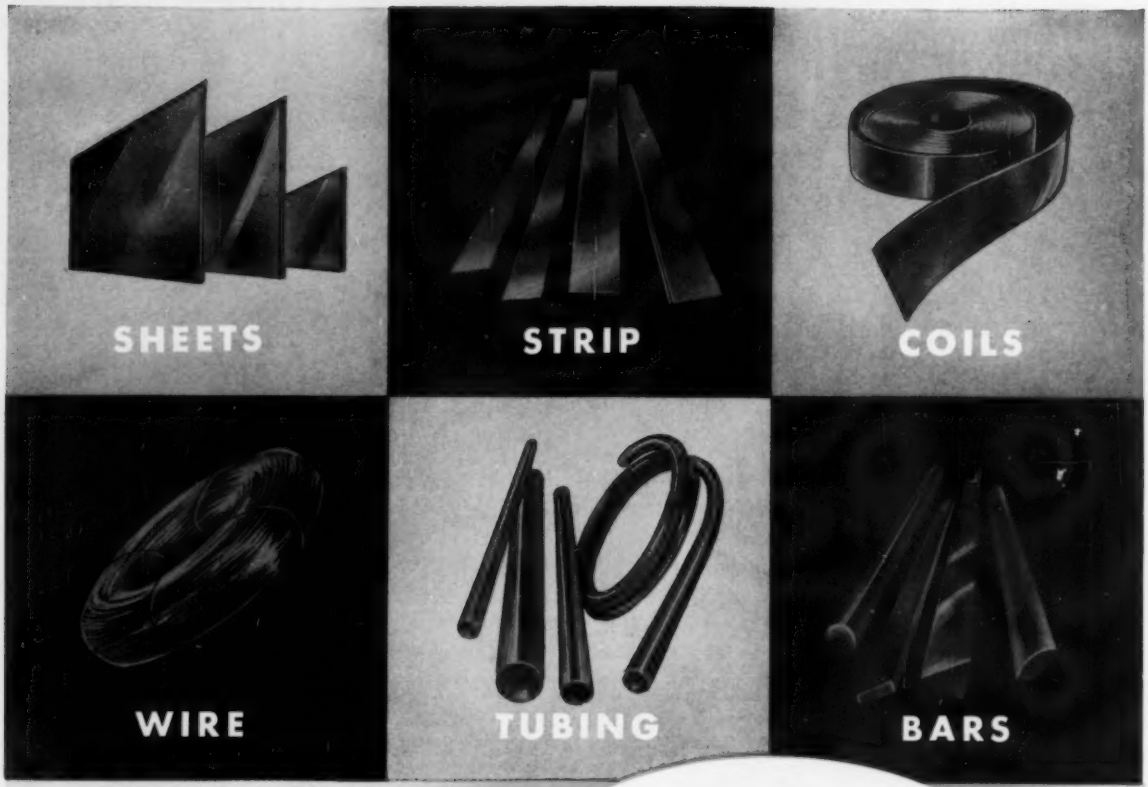
CITY _____ ZONE ___ STATE _____



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THERE'S EXACTLY
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MILLER SR RECTIFIER TYPE DC ARC WELDERS

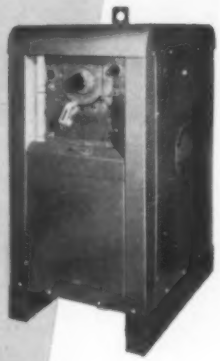
Available in 200, 300, 400 and 600 amperes, it is a superior direct current welder using Miller Unitran transformer control and selenium rectifiers for conversion from 3 phase AC line current. Miller SR Welders feature widest possible current range, extreme arc flexibility, maximum electrode deposition rate and highest electrical efficiency.

THE *New* MILLER SRH RECTIFIER TYPE DC ARC WELDER

A new concept in welder design for all DC metalic arc welding. Available in 200, 300 and 400 amperes. It is ruggedly constructed, compact, and is designed to lend itself to stacking for parallel operation or to conserve floor space. It has single range control and is weatherproof.

MILLER ARC WELDERS FOR TUNGSTEN ARC WELDING PROCESS

These Miller Welders feature the patented Miller UNITRAN control circuit which combines the transformer with its own integral flux diverter. This, in conjunction with adequate open circuit voltage, high frequency, balancing resistor and optional controls insures superior uniformity and flexibility throughout the entire welding range. Available in nine models.



THE *New* MILLER MULTI ARC COMBINATION AC-DC WELDER

Available in 14 models, this new Miller Welder provides both AC and DC welding power for applications where both are required. It operates from a single phase power line and is available with high frequency and controls designed especially for inert gas arc and spot welding.

MILLER 100 SERIES HEAVY DUTY INDUSTRIAL TYPE AC WELDERS

Designed for heavy production welding and automatic welding applications. Available in eight models. The 100 Series Welders permit faster welding—as much as 35% faster. Movable coil design and 80 volts O.C.V. produces uniform and better welding characteristics throughout the entire range of the welder.

Write today for complete information on these Miller Welders.

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"... if it's MILLER you know it's the finest..."

Pressman checks a final copy in controlled humidity of the press room.

Men and machines bring news to you

American Blower plays vital role in air conditioning one of the world's largest newspaper plants

At the new building of The Philadelphia Evening and Sunday Bulletin, gigantic newspaper printing presses reel off 210,000 newspapers an hour . . . in an atmosphere controlled by American Blower equipment.

A relatively high humidity in the press room is a must – for the speeding miles of paper could tear if too dry, and cause a delay. This added moisture, precisely controlled, also improves printing. The stereotype section, however – where lead printing plates are cast – calls for different treatment. Here, American Blower ventilating equipment works 'round the clock to rid the area of heat generated by the metal pots.

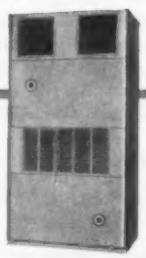
Considered by many as "the mechanical showcase of modern journalism," the new Bulletin Building requires varied air conditions throughout its over 500,000 sq. ft. area. For cooling, heating, ventilating, air filtering, humidifying, and dehumidifying – both men and machines depend on 78 American Blower units in the race of getting news to readers faster.

You can count on American Blower, too . . . whether your air-conditioning needs are large or small, normal or unusual. Just phone our representative near you.

New Bulletin Building. Architects: George Howe & Robert Montgomery Brown. Mechanical Contractors: Riggs Distler & Company, Inc. Special Consultants: William Ginsberg Associates. Consulting Engineers: A. Ernest D'Ambly; Pennell & Wiltberger; Keast & Hood.

In the section where printing plates are made, there is 'round-the-clock ventilation . . . to exhaust heat generated by the melting and casting of lead.

faster—thanks to conditioned air



In addition to equipment for complete central systems—American Blower offers packaged air conditioners for offices, stores, industrial plants, and similar applications.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
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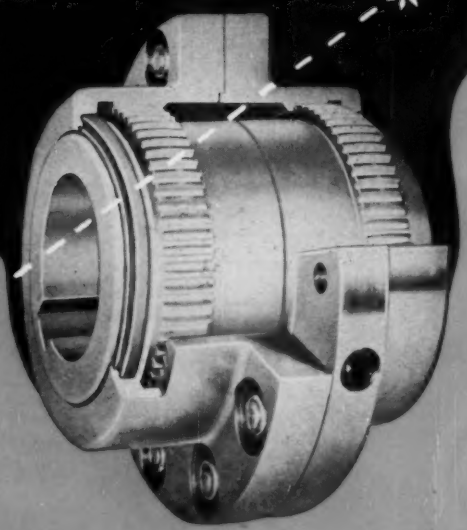
AMERICAN BLOWER

Air-conditioning equipment for every business

WALDRON

built for long life

COUPLINGS



preferred for their

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DESIGN FEATURES

1 ALL STEEL construction from high grade steel forgings with fine tool finished surfaces.

2 ONE PIECE COVER SLEEVE is one solid forged steel unit for added safety at high speeds.

3 AUTOMATIC LUBRICATION with ever-present oil film between hub and sleeve to prevent friction or wear.

4 POSITIVE SEAL hermetically seals coupling against oil oxidation and keeps ample supply of CLEAN oil inside.

5 LONGER LINING UP SURFACE insures easy, accurate initial alignment and full capacity to handle any subsequent misalignments.

6 COVER SLEEVE BEARING prevents any added pressure to either shaft; eliminates adverse end crank action on shaft.

7 LARGER BORE permits use of smaller physical capacity for same size shaft and reduces rotating weight.

WALDRON couplings are available in sizes up to 18" shaft diameter. We specialize in furnishing couplings for unusual applications and services. We would be pleased to send you our latest bulletin 55-H upon request.

JOHN WALDRON CORPORATION
New Brunswick, N. J.
Since 1827

Sales Representatives In Principal Cities

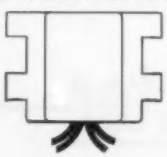
Another FURNAS "FIRST" "DUAL SEAL" COILS

FEATURES

- Moisture and Fungus Resistant
- Excellent Heat Dissipation
- Dimensionally Stable
- Mechanically Stronger
- Non-combustible

Furnas Electric again leads the field—this time with magnetic controls with Dual Seal coils for longer control life. Dual Seal molded coils are moisture and fungus resistant, dimensionally stable, age resistant, will not support combustion and have high dielectric strength. Their mechanical properties eliminate the damage often caused by vibration or impact.

DUAL VOLTAGE COILS



Coil changing is virtually eliminated and stocking of coils simplified with the new Dual Seal dual voltage coils. For example, on 3, 7½ or 10 hp. starters, one 220-440 volt Furnas Electric coil is used where six are normally required.

Write today for free 140-page Catalog 101. Furnas Electric Company, 104 McKee Street, Batavia, Illinois.

FURNAS ELECTRIC COMPANY
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How to get more for your dollar in stainless steel fittings!

When you specify TUBE-TURN* Welding Fittings and Flanges . . . regardless of type, size or material . . . you can be *sure* you are getting *top value.* Manufacturing improvements which we are constantly making assure not only unsurpassed quality, but economies which are passed on to you.

In TUBE-TURN Stainless Steel Welding Fittings, for example:

Recent advancements in our production techniques have netted important savings, resulting in price reductions. Are you taking advantage of these savings . . . plus the extra values described on the next page?

TUBE-TURN Welding Fittings and Flanges are made in U.S.A.
They meet *all* U.S. piping code specifications.

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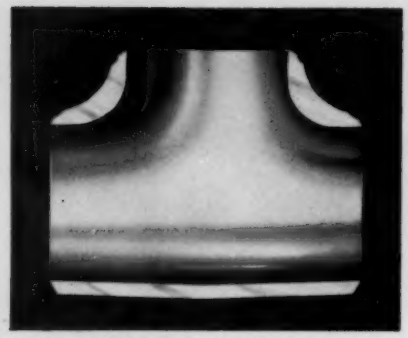
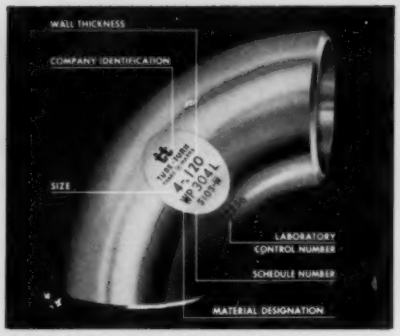
EXTRA VALUES



MATCH PIPE for calculated bursting strength.



LONG-LASTING IDENTIFICATION. Lectro-etch markings give complete, permanent information. Fittings have bright, attractive finish.

UNIFORM WALL THICKNESS. Pipe minimum wall thickness tolerance of 87½% of nominal thickness is maintained.

TUBE-TURN*

Stainless Steel Welding Fittings and Flanges offer you these extra values

MEET ALL CODES: ASTM A312 (for material); MSS SP43 and ASA B16.9 (for dimensions); MSS SP25 (marking procedure).

COMPLETE LINE IN STOCK . . . four analyses: Type 304, 304L, 347 and 316. Four wall thicknesses: Schedules 5S, 10S, 40S, 80S.

WALL CHART of dimensions of popular sizes of TUBE-TURN Stainless Steel Welding Fittings and Flanges.

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224 East Broadway, Louisville 1, Kentucky
Please send me chart TT 730.

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*City*_____ *Zone*____ *State*____

*Your Name*_____

*Position*_____

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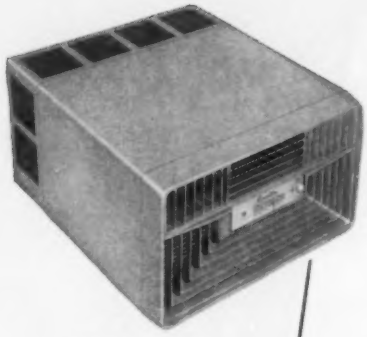
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

LOUISVILLE 1, KENTUCKY



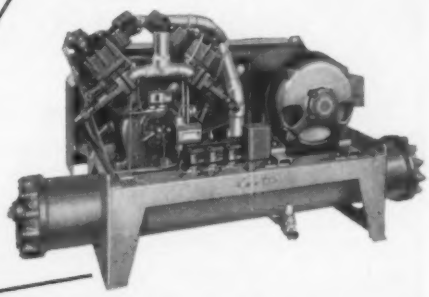
Window Air Conditioners

Packaged Air Conditioning units—2 to 20 tons

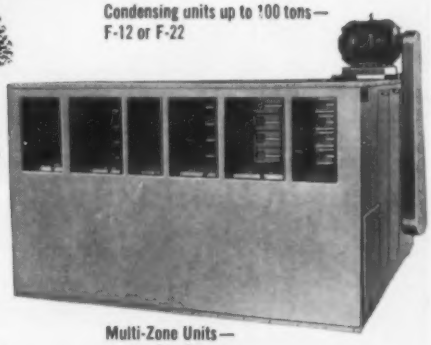
More jobs... More profit!

WITH THIS

complete Curtis LINE

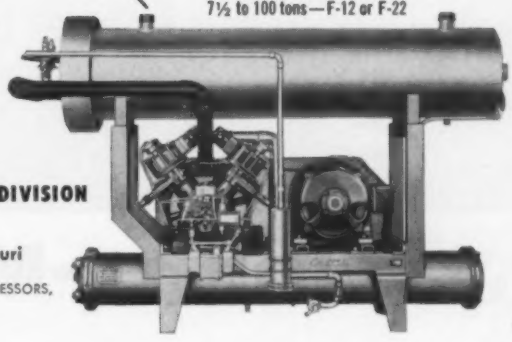


Condensing units up to 100 tons—F-12 or F-22



Multi-Zone Units—serving 2 to 8 zones

Packaged Liquid Chillers—7½ to 100 tons—F-12 or F-22



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WRITE TODAY for information on how you can obtain a Curtis direct factory franchise.

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Now!

a new, molded silica insulation

developed by

Johns-Manville Insulation Research

✓Can't shrink...

Fibrocel alone offers all these advantages

- No shrinkage—eliminates gaping joints
- Resists compression—firm in structure
- Uniform dimensions—precision formed for exact fit
- Economical application—lightweight, easy to cut with a knife
- Thermal effectiveness
- Permanence—flame, rot, odor and vermin proof

Can be easily installed—Fibrocel is light, easily cut with a knife. Uniform dimensions assure tight, smooth joints and neat appearance.

Johns-Manville *first-in*

✓Resists deformation...

✓Easier to apply...

FIBROCEL®

PIPE INSULATION

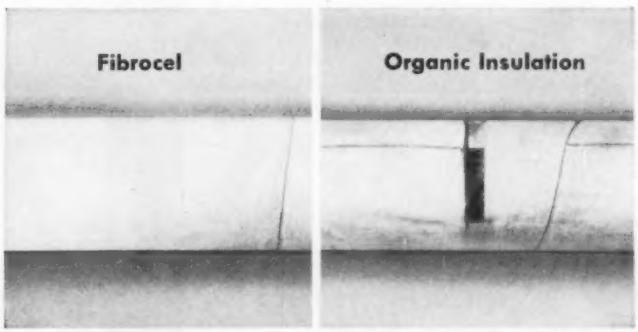
For plumbing, heating and air conditioning systems

● Johns-Manville Fibrocel is an entirely new concept in pipe insulation for the 35F to 300F temperature range. In the manufacturing process tiny particles of silica are exploded and expanded to form a cellular structure of "dead" air spaces. It incorporates in one material a combination of properties not found in any existing insulation for heating and plumbing service.

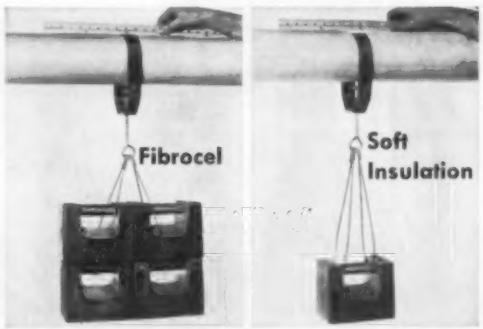
Fibrocel completely eliminates objectionable shrinkage caused by atmospheric changes. It permits no gaping, unsightly joints with accompanying heat leakage. Strong and firm in texture, Fibrocel resists deformation. Dimensionally uniform, it provides exact fit and neat appearance. Light in weight, it is readily handled. Fibrocel speeds application, keeps costs at a minimum.

This new insulation has been developed and tested in the world's largest insulation laboratory, located at the Johns-Manville Research Center. It has been proved in actual field installations. And it is backed by more than 96 years of Johns-Manville experience in insulation engineering.

Available now—Fibrocel is in commercial production. Architects, contractors, and engineers can secure full information from J-M District Offices. Or write for Brochure IN-155A, address Johns-Manville, Box 60, New York 16; in Canada, 565 Lakeshore Road East, Port Credit, Ont.



Joints stay tight—tests prove Fibrocel does not shrink, even after severe moisture exposure and service under continuous steam flow. Ordinary organic insulation shows substantial joint shrinkage after same test.



Withstands compression—tests prove Fibrocel suffers no deformation or compression even under 200-lb. weight. Softer type insulation shows marked deformation after being subjected to 50-lb. weight.

INSULATION MATERIALS · ENGINEERING · APPLICATION

JOHNS-MANVILLE JM PRODUCTS

These are Zallea Pressure-Balanced Expansion Joints. They provide a sound engineering solution to the problem of absorbing pressure thrust where a change in direction occurs, and it is not possible to anchor the elbow.

Their operation is simple. Both expansion joints shown are designed to absorb axial and lateral movement in the inboard bellows. By means of tie rod action, the pressure thrust of the inboard bellows is balanced by the countermovement of the outboard bellows. This design is frequently used in piping connections to a turbine to eliminate the pressure thrust against the turbine casing. Many other applications may occur to the design engineer.

An original Zallea design, these specialized joints are another example of our ability to develop, engineer and manufacture expansion joints to meet your specific needs. For information on standard types, or help with special expansion or piping problems, call in a Zallea representative.

Zallea *expansion joints*

ZALLEA BROTHERS. 816 LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints

NOW - Waterloo offers you
The Most Usable
Size Selection Table
In The Register Industry

- Newest
- Most Complete
- Easiest To Read

WATERLOO REGISTER CO., Inc. - Wate

RECOMMENDED OUTLET VELOCITIES FOR → **Broadcasting and TV Studios, Hospital Operating Rooms, Private Offices** | **Classrooms, Libraries, Residences** | **Hotel Rooms, Hospital Rooms** | **Theatres, Restaura, Gener**

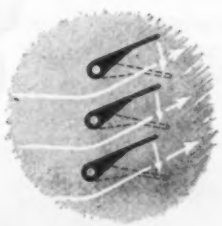
Outlet Size	Deflection	200 FPM CFM	Thro	Drop	Static Pres.	400 FPM CFM	Thro	Drop	Static Pres.	600 FPM CFM	Thro	Drop
8x4	22½°	27	3.2	3.2	0.002	53	10.4	3.6	0.007	80	14.7	
	0°	29	4.0	3.7	0.002	59	12.9	4.1	0.006	88	18.3	
	45°	22	1.8	1.7	0.003	45	5.7	1.9	0.008	67	8.1	
10x4	22½°	34	4.2	3.5	0.001	68	11.1	3.9	0.007	102	15.8	
	0°	37	5.2	4.0	0.001	75	13.8	4.5	0.006	112	19.6	
	45°	29	2.3	1.8	0.001	57	6.1	2.1	0.008	86	8.	
12x4	22½°	41	6.4	3.2	0.001	82	11.6	4.3	0.007	123		
	0°	45	8.0	3.7	0.001	90	14.4	4.9	0.006	13		
	45°	35	3.5	1.7	0.002	69	6.4	2.3	0.009			
	22½°	48	7.3	3.6	0.001							
	0°	53	9.1	4.1	0.001							
	45°	41	4.1	1.	0.00							

Waterloo AIR DIFFUSION EQUIPMENT

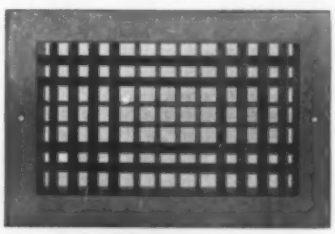
Every Figure Used Is Based on Recent Actual Laboratory Tests of Waterloo's 4-Way Directional Control Grille which features

The Exclusive Silent Flow "Tear Drop" Louvre Design

Note how easy it is to select proper sizes with salient features emphasized in Red. This complete 6 page table, including instruction for use and Return Air Selection Table is now an integral part of the Engineering section of all Waterloo New Series 9-55 catalogs. However, this 6 page Selection Table is also available as a separate folder. Order as many extra copies as your organization requires to facilitate the exacting process of SIZE SELECTION of outlets on commercial jobs.



Provides unobtrusive diffusion with SUFFICIENT SURFACE to turn high velocity air WITHOUT TURBULENCE.



2V SUPPLY GRILLE

For long or short throw. Each blade individually adjustable for 4-way deflection at degree desired.

USE COUPON →

There's a Waterloo Representative near you who will gladly call with complete information—or we will send sufficient material to supply your needs for all qualified users — architects, engineers and contractors.

WATERLOO REGISTER CO., Inc.

P. O. BOX 72 **WATERLOO, IOWA, U. S. A.**

- ☐ Have the local Waterloo Representative call
- ☐ Send us the new 9-55 Waterloo Catalog
- ☐ Send —— copies of the SIZE SELECTION TABLE only

Firm Name .....

Address .....

City ..... State .....

Signature .....

SETTING THE PACE
IS TRADITIONAL WITH COPELAND

'Way back when we first announced the COPELAMETIC, its potential was recognized quickly by refrigeration people. The original "accessible hermetic" enjoyed immediate acceptance, because it filled a practical need. We're complimented that it "sets the pace" for others to follow.

Basic ingredient for engineering progress is to know what's needed. Copeland has done that by working closely with manufacturers, dealers and users. We've lived with your problems. We're convinced that it pays off for everyone.

Now, Suction Cooling Extends Range of Air-Cooled Units for Air Conditioning

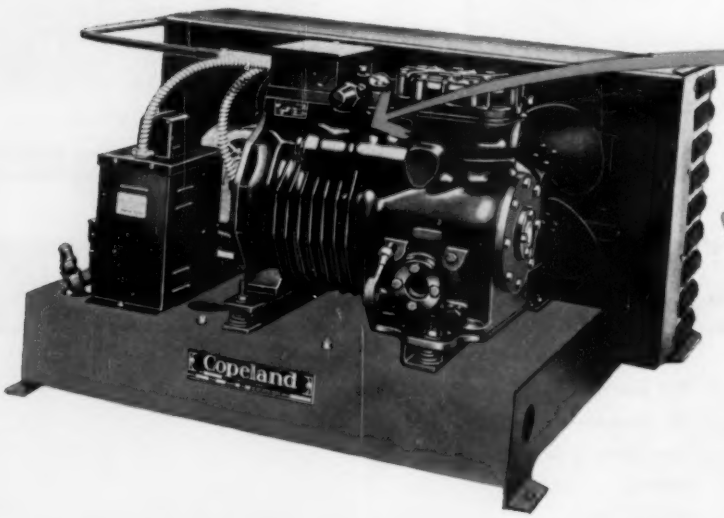
One of the frequent problems in the rapidly expanding, central air conditioning market has been water requirements. At Copeland we met this difficulty head on, and our answer is in condensing units with suction-cooled motor-compressors in sizes through 5 H.P.

The Copelametic line includes a range of smaller size units using the principle of suction cooling. They afford greater flexibility of installation, since no water is needed. Now the larger sizes make possible even wider applications.

The new 2, 3 and 5 H.P. suction-cooled Copelametics are designed especially for air conditioning and other high suction pressure installations. Oversize, finned-tube condensers on these models insure maximum efficiency in high ambient temperatures.

New specification sheets on Copelametic suction-cooled motor-compressors and condensing units give all the facts. Send for your copies TODAY.

Copeland
DEPENDABLE *Electric* REFRIGERATION



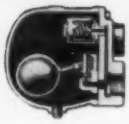
THIS MAKES THE DIFFERENCE

MODEL ZR-300H
Air-cooled unit with Suction-cooled Copelametic motor-compressor

COPELAND REFRIGERATION CORPORATION • SIDNEY, OHIO

SARCO HEATING SPECIALTIES—a complete line

Float Thermostatic Steam Traps



Inverted Bucket Steam Traps

Thermodynamic Steam Traps

Radiator Valves

Radiator Traps

Strainers

Air Eliminators

Balancing Fittings

Lift Traps

Motor Valves

Temperature Regulators

Water Blenders

Dial Thermometers

Room Thermostats

SARCO and SARCOTHERM

UNDIVIDED RESPONSIBILITY

for complete lines of

- ★ Heating Specialties
- ★ Finned-Tube and Baseboard Radiation
- ★ Weather-Compensated Control Systems

SARCO COMPANY, INC. · SARCOTHERM CONTROLS, INC.
Empire State Bldg., New York 1, N. Y.

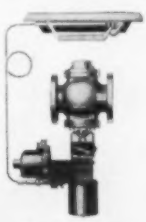
DEPENDABILITY that spells USER SATISFACTION

SARCO CONDENSATE AND VACUUM PUMPS

SARCOTHERM WEATHER-COMPENSATED CONTROL SYSTEMS

Complete Systems Include All Accessory Equipment

Modulating Controls for hot water and radiant heating



Modulating Controls for steam heating

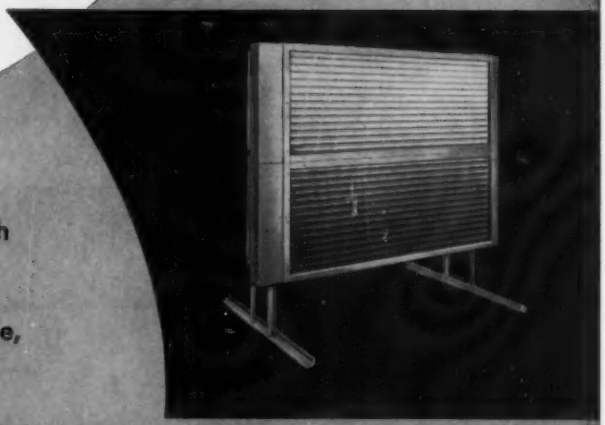
Type AQ Controls for hot water and radiant heating

SARCOfIN

finned-tube and baseboard radiation

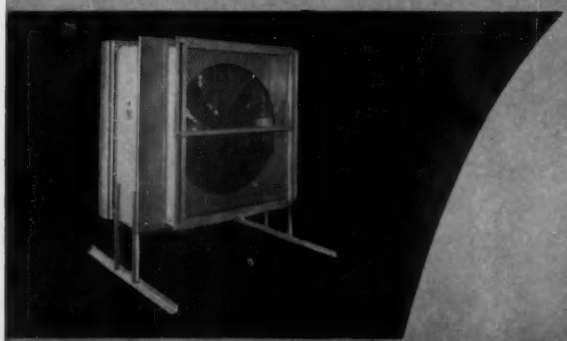
2132B

STOP *using water!*



Eliminate all water problems with UNICON by KRAMER. Any size compressor, regardless of tonnage, can be air-cooled with UNICON.

KRAMER **UNICON**



Stands, hoods, and wind deflectors are available for simplified outside mounting

You need nothing else!

WRITE FOR BULLETIN U-210C

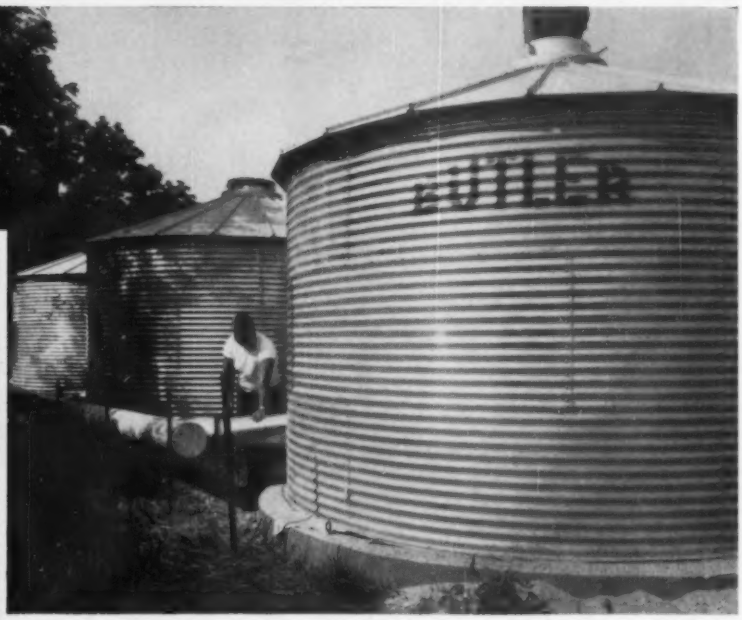
KRAMER TRENTON CO. • Trenton 5, N.J.

BUTLER MANUFACTURING COMPANY uses

USS Galvanized Steel Sheets

for large grain storage bins

AS SHOWN HERE, these three Butler Storage Bins are part of the "on-the-farm" storage of Mr. Elmer H. Miller, White Pigeon, Michigan. Each bin holds 1000 bushels of grain and is equipped with a crop conditioning fan. The tightly-adhering zinc coating on USS Galvanized Steel Sheets will assure many years of service for these bins.



HERE corrugated body sheets are being curved with a radius roll. Other, more severe steps in the fabrication of Butler Storage Bins demand top quality steel—the sort of quality that's a hallmark of USS Galvanized Steel Sheets.

These new grain bins, recently manufactured by the Butler Manufacturing Company at Galesburg, Ill., Minneapolis, Minn., and Kansas City, Mo., are especially designed to serve farmers with "on-the-farm" storage of grains. To develop a bin that would be relatively fast and easy to fabricate, reasonable in cost, and give the farmer good storage, the Butler Mfg. Co. made extensive use of USS Galvanized Steel Sheets.

There are many reasons why USS Galvanized Steel Sheets are so often selected for use on very important jobs like this. USS Galvanized Steel Sheets have outstanding qualities which make them especially valuable to Butler, and to you. They have a tight, uniform coating that will not flake even under severe bending, shearing, trimming and forming operations. They draw smoothly and evenly. And because USS Galvanized Steel Sheets are made from top quality steel, they assure a good, sound finished product . . . one that will give many years of service.

USS Galvanized Steel Sheets are another outstanding product of United States Steel. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

USS GALVANIZED STEEL SHEETS

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

UNITED STATES STEEL

Photograph shows a section of the Langley-Bath Clearwater High School, located at Bath, Aiken County, S. C. It received design awards in the AASA-AIA School Building exhibition and the South Atlantic AIA Regional Honor Awards Program and from the School Executive magazine.

Lyles, Bissett, Carlisle & Wolff, architects.
E. M. Spong Construction Co., general contractor.
W. O. Blackstone & Company, plumbing and heating contractor.
All of Columbia, South Carolina.

YOUNGSTOWN PIPE installed in award-winning school

The planners of this school looked toward the future and specified pipe that will insure adequate protection to the radiant heating system for years to come. For years to come, because Youngstown Pipe is made only of the finest steel. Its quality is closely controlled from ore mine right through to the final threading operation.

The 7 points of uniform goodness in Youngstown Pipe add up to the fact that you can't go wrong with Youngstown. Be sure it is specified on your next order.

Having Problems?

For information and service, get in touch with the local distributor of Youngstown Steel Pipe—or phone our nearest District Sales Office.

7 reasons why YOUNGSTOWN PIPE was selected

1. Uniform Ductility
2. Uniform Lengths
3. Uniform Threading
4. Uniform Weldability
5. Uniform Wall Thickness and Size
6. Uniform Strength and Toughness
7. Uniform Roundness and Straightness

Youngstown

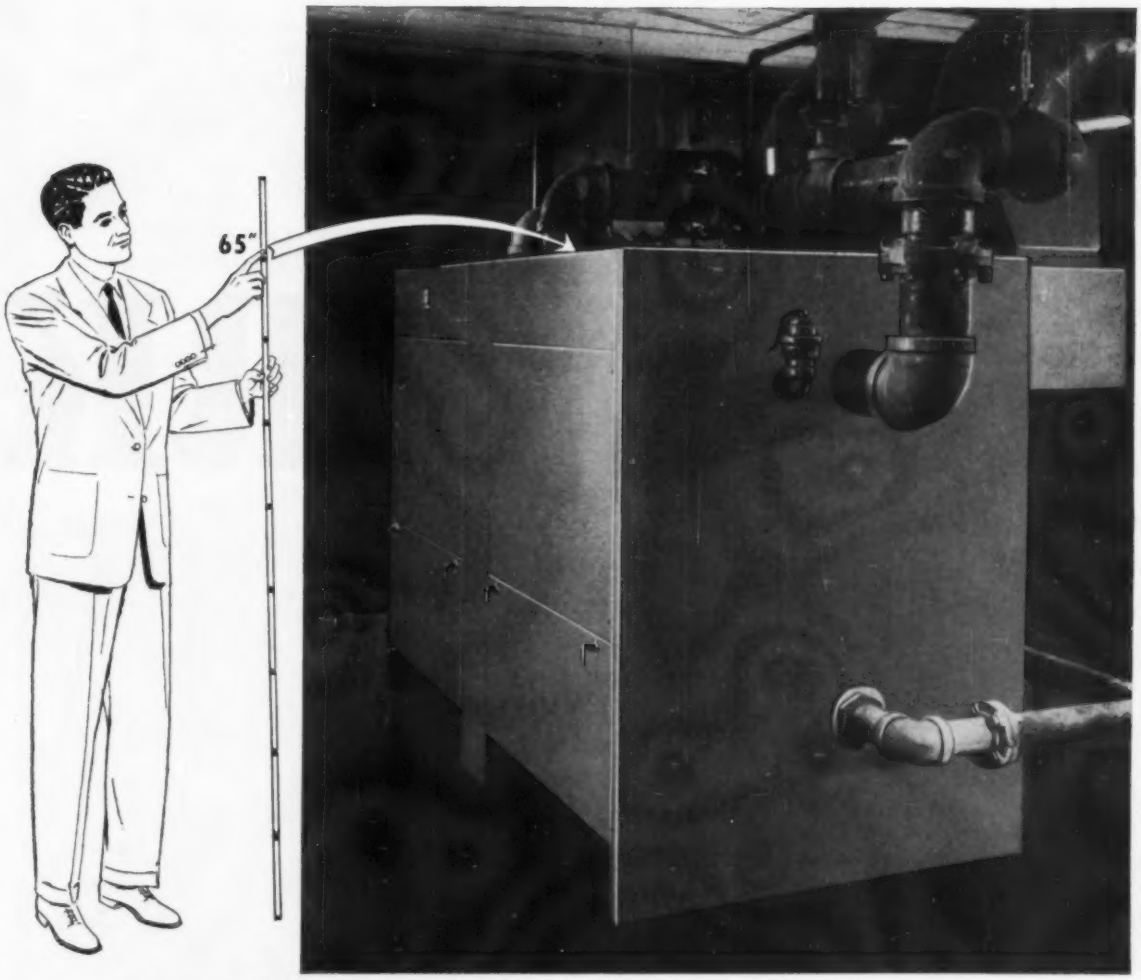
STEEL QUALITY YOUNGSTOWN SERVICE PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

The New AMERICAN-Standard Gas-Fired Boiler small in size . . . BIG IN HEATING CAPACITY



These new G-6 Boilers stand only 65" high— they occupy little space and require minimum headroom.

THE AMERICAN-STANDARD G-6 Boiler in the picture isn't very big (it takes up only 31.5 sq. ft.), but it has a heating capacity of 2,600,000 Btu/hr. input. That's more than enough to keep a 30-classroom school or a 4-story office building warm and comfortable in zero weather!

Drafthood, manifold and controls are completely enclosed in a handsome steel jacket to give the new boiler a neat, trim look. Big access doors and panels make the G-6 easy to maintain and service.

You can get the new automatic G-6 Gas-Fired Boiler with inputs ranging from 650,000 to 5,200,000 Btu/hr. It's easy to install. The G-6 is made of durable cast iron—like all efficient boilers—for a lifetime of dependable heating.

For more information write to AMERICAN-Standard PLUMBING AND HEATING DIVISION, American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pennsylvania.

AMERICAN-Standard

HOT WATER HEAT

SILENCE FAN AT WORK

We'd like to make a big noise about something quiet at Utility – our new silent Direct Drive Blowers specially designed with Neoprene hubs to cushion and isolate the motor noise so you have practically no-sound operation.

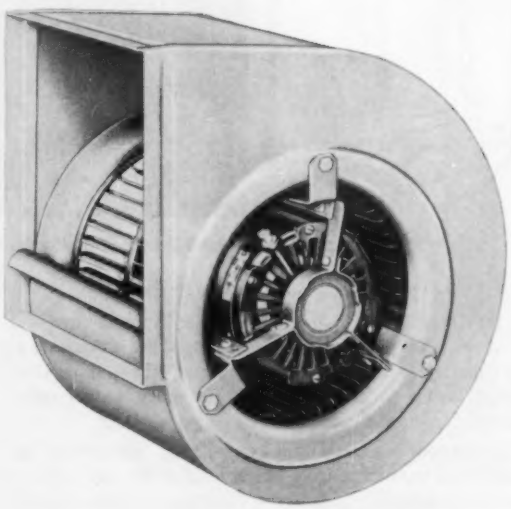
The Neoprene hub costs you nothing extra – proof again of Utility's quality engineering combined with quantity pricing.

The first to produce this far-advanced feature, Utility consistently pioneers in high speed production development to give you the best products in its field at lowest cost.

Utility's Direct Drive Blowers are adaptable to the manufacture of heating, cooling, refrigerating and ventilating equipment. These blowers require less space, have no unnecessary accessories and can be speed-controlled easily.

Check Utility for blowers, blower parts or any combination of parts – and discover for yourself . . .

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE



A Division of Utility Appliance Corporation

UTILITY FAN CORPORATION

911 East 59th Street, Los Angeles 1, California

Producers of blowers and blower parts for original equipment manufacturers. Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Write for catalogue data.

PRITCHARD LOLINE COOLING TOWER— SEVEN IMPORTANT WAYS BETTER!

1. The LOLINE has *galvanized* steel fan drive supports and basin accessories rather than cheaper, less durable painted steel.
2. The LOLINE brings grease fittings for the bearings on the V-belt drive to the outside of the tower for easier, safer maintenance.
3. The LOLINE features a *corrugated* asbestos cement board casing rather than flat asbestos cement board sheets—for greater strength and protection.
4. Lowest silhouette tower in the field, the LOLINE over-all height is just $7' 7\frac{11}{16}"$.
5. Asbestos cement board louvers are installed as standard, not special, equipment on all LOLINE towers, for better appearance.
6. The LOLINE offers you an internal pipe supply system which permits the architect or engineer to completely conceal the piping. This is optional equipment.
7. The V-belt drive on all LOLINE towers features a stainless steel fan shaft for longer tower life.

INDUSTRY'S PARTNER FOR PROGRESS

COOLING TOWERS
GAS & AIR TREATING EQUIPMENT

REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 499, 4625 Roanoke Parkway, Kansas City 12, Mo.

GET ALL THE FACTS!

NEW LOLINE BULLETIN is available to you absolutely free of cost or obligation. Tells you *all* the facts about the lowest silhouette tower of 75 tons capacity and up now available: Why the LOLINE was developed, illustrations and descriptions of framework and mechanical equipment, typical cross section, capacity table, optional equipment, name and address of Pritchard sales office nearest you. Send for your complimentary copy today.

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☐ Please send me the bulletin on LOLINE cooling towers.

☐ Please have your representative contact me.

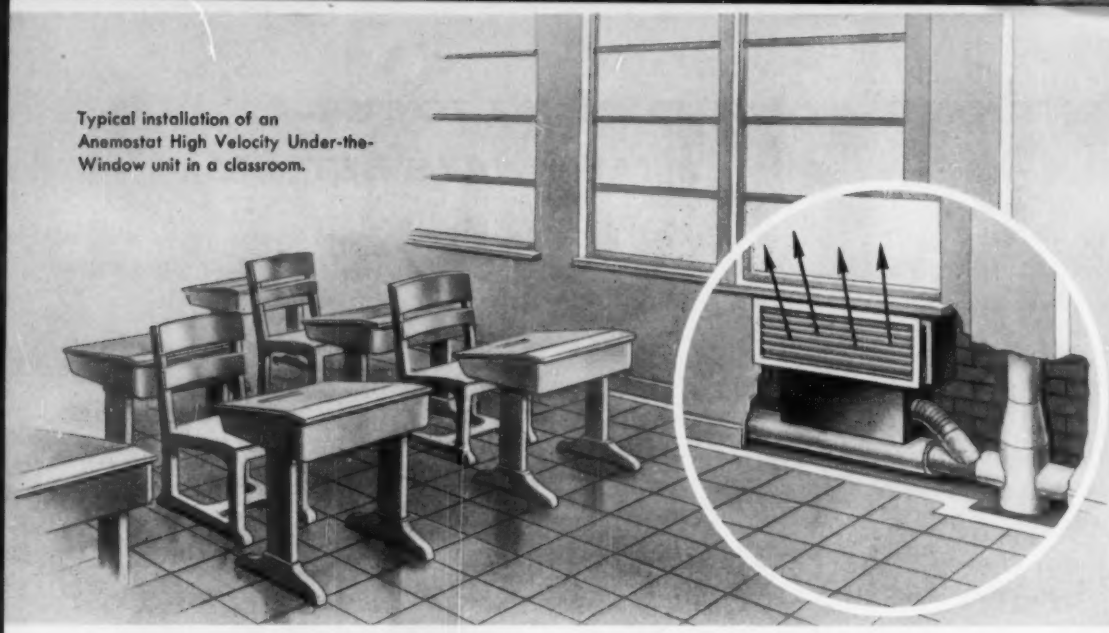
Name _____

Title _____

Firm _____

Address _____

City _____ Zone _____ State _____



Typical installation of an Anemostat High Velocity Under-the-Window unit in a classroom.

How to deliver

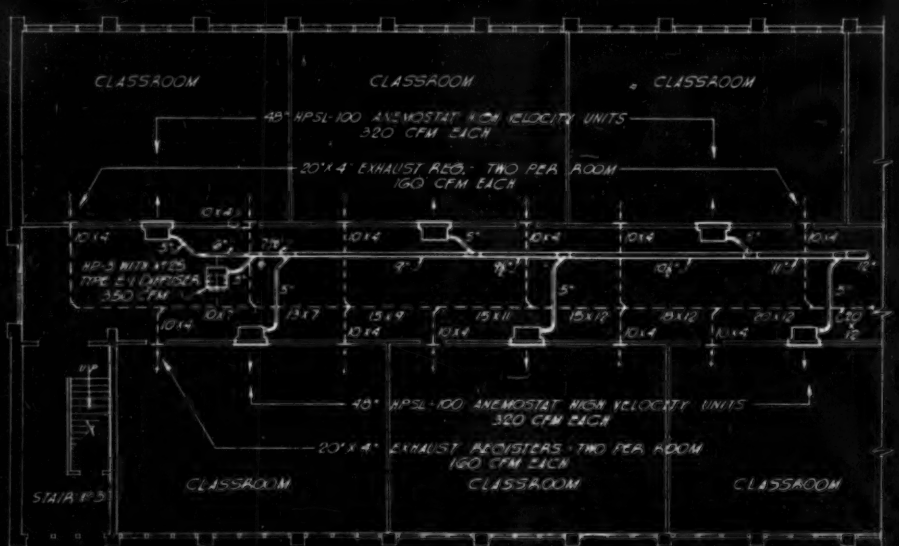
high velocity air to schoolrooms

Shown here are two ways of using the Anemostat All-Air High Velocity system of draftless air distribution for heating and ventilating schools. Under-the-Window units (above) are the most practical for colder climates. Corridor distribution (below) is preferable in warmer climates.

Advantages:

- All-Air High Velocity units require smaller than conventional ducts, thus save space and money.
- All-Air HV units can be used for individual or zone control, in single or dual duct installation.
- Since air is supplied from the main equipment room, there is no need to break through the outside of the building for prime air make-up. This eliminates grilles, dampers, possibility of leaks.
- The Anemostat All-Air HV system can be simply installed by the sheet metal trades. No supply or return pipes are required. Units are quiet, need a minimum of maintenance from custodians.

For latest data on All-Air High Velocity units, write on your business letterhead for new Selection Manual 50 to Anemostat Corporation of America, 10 E. 39 Street, New York 16, N. Y.



Diagrammatic layout shows corridor distribution of high velocity air for wing of school.

BALTRIC...
THE MOTOR THAT COULDN'T
BE BUILT BEFORE
BALTRIC
Now, in a complete line of totally enclosed motors, Baltric brings you the best answer yet to your motor problems. Less weight . . . less bulk . . . better performance, are the results of advanced engineering and new and better materials.
The new Baltric Motors pack much more power per ounce . . . permit applications and installations of greater versatility. Simple in design, rugged, yet compact and dependable, Baltric does a better job in less space than old-style motors. Baltric is a better bet for every use.
Baltric Motors are available in a complete range of models, ⅛ h. p., through 5 h. p., squirrel cage induction type, both polyphase and single phase. Baltric Motors can also be engineered to meet your special mechanical and electrical requirements.
Original Streamcooled Baldor Motors Available—Built to Former NEMA Standards
ALL BALTRIC MOTORS TOTALLY ENCLOSED AND STREAMCOOLED
BALDOR ELECTRIC COMPANY
Baltric Motors Are Available in Polyphase
Squirrel Cage • Induction and Single Phase
Capacitor Start • Induction Run Types
4353 DUNCAN AVENUE • ST. LOUIS 10, MISSOURI

CHASE® Copper Water Tube for Radiant Heating—*saves you time!*

Because Chase Copper Water Tube comes in long lengths of 60 and 100 feet, fewer joints are needed—a time-saving feature that *also* means a neat, *pressure-tight* radiant heating installation.

And Chase Copper Water Tube is easy to install. It's light in weight, can be easily bent *by hand,* and can be joined quickly with leakproof Chase Copper Solder-Joint Fittings ...using standard soldering techniques.

Furthermore, Chase Copper Water Tube can't clog with rust. Once installed, it's there to *stay*—protecting your reputation with *years* of leakproof service.

Your Chase Wholesaler stocks Chase Copper Water Tube and Solder-Joint Fittings in all sizes. Call him today.

Chase Products mean
a quality job at little
or no extra cost!

Chase®

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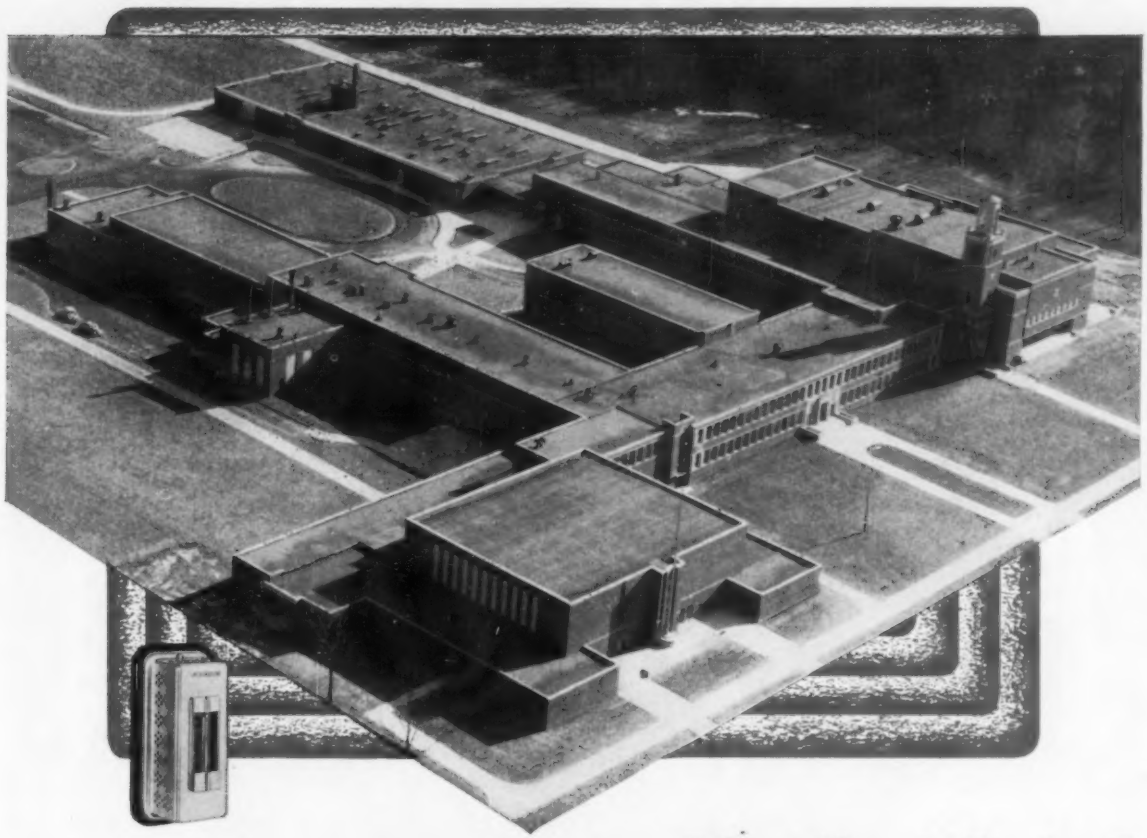
	St. Louis	San Francisco	Seattle	Waterbury	



RATE HEATING PLANT with JOHNSON CONTROL "Most Nearly Perfect"

Educational facilities at the new $5 million Senior High School* in Parma, Ohio, are widely acclaimed as among the nation's finest. Equally impressive are the building's mechanical features, notably its highly efficient heating and ventilating systems.

Comfort *could* be a real problem in this building. Its size alone creates special problems. So do the large number of rooms, which vary in area from little more than 100 square feet to more than 10,000 square feet. Other factors affecting comfort include the use and occupancy levels in such diversified locations as classrooms, offices, the 540-seat cafeteria and social center, the library, the 1,800 capacity auditorium and numerous others.

All of these problems, and more, are compensated for by a specially engineered system of Johnson Automatic Temperature Control which operates the heating and ventilating systems and insures ideal temperatures for every purpose.

Here's what George Rose, the school's engineer, has to say about it: "Our heating system is the most nearly perfect one I have seen. The automatic control system helps keep our fuel expenditures at a minimum. Yet it gives us the flexibility we need to satisfy all comfort requirements throughout the building. It also reduces the need for operating personnel and requires very little maintenance."

Any building—small or large, new or existing—can enjoy these same superior comfort and economy advantages of a Johnson engineered Control System. An engineer from a nearby Johnson branch will gladly discuss your temperature control problems and give you his recommendations without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

**Parma Senior High School, Parma, Ohio. Fulton, Krinsky & Dela Motte, architects; L. B. Mumma, mechanical engineer; The Feldman Brothers Company, heating contractor; all of Cleveland.*

JOHNSON CONTROL
TEMPERATURE AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

Pittsburgh Fiber Glass . . .

The best ductwork insulation you can use costs less to install!

Besides its superior thermal and acoustical insulation qualities, Pittsburgh Superfine Fiber Glass Insulation is extremely easy to install as either duct liner or duct wrap . . . saves dollars for you on labor costs.

PPG Superfine is easily cut to shape with either knife or shears, fits all ductwork shapes easily. Applied with either adhesives, tapes, cord or wire, PPG Superfine's complete range of insulation thicknesses can be supplied with cloth, asbestos, paper, aluminum foil or vinyl facings to serve the specific requirements of any application.

Be sure to get complete facts on the unusual economies and quality insulation values that Pittsburgh Superfine Fiber Glass can provide your ductwork system. Write our executive offices or our district sales offices in Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia or St. Louis. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

FIBER GLASS PPG PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

*This is not an idle claim . . . it's a fact . . . PROVEN UNDER ACTUAL INSTALLATION AND MAINTENANCE CONDITIONS.

Make no mistake about it . . . no matter how *small* your filter requirements . . . or how *large*, here is a completely new air filter development that can *absolutely cut your clean air maintenance costs in half.*

NO HEAVY TENSION OIL — Evans filters do not have a messy, sticky type of adhesive that is filthy to handle and difficult to clean. It is unnecessary and is forbidden in the use of Evans filters.

CLEAN WITH TAP WATER — Evans filters can be cleaned clean in minutes with nothing ever but tap water sprayed through an ordinary garden hose nozzle. They require no expensive fireproof room. No caustic cleaning solutions or agents. This eliminates all danger in the cleaning of Evans filters.

LIGHT WEIGHT CUT LABOR COSTS — Evans filters are all aluminum. Light to handle, to carry, to pick up. In spite of airtight fitting frames, Evans filters pull quickly and easily in and out of the frames. Take much less effort, less labor to handle. No latches . . . or lugs *required.*

REMEMBER: Initial costs for air cleaning equipment are not the big factors or controlling factors in the cost for clean air.

IT'S OPERATING COSTS THAT YOU MUST LIVE WITH AND THAT YOU MUST CONTROL.

EVANS FILTERS GIVE YOU THAT CONTROL. MAKE IT POSSIBLE FOR YOU TO SAVE 50% ON CLEAN AIR MAINTENANCE COSTS.

- ALL ALUMINUM
- EVERY PART PRECISION MADE
- HOLD UP TO 200% MORE DUST AND LINT WITHOUT HARMFUL RESTRICTION TO AIRFLOW
- GIVES LIFETIME SERVICE

FREE CATALOG MAIL COUPON TODAY

THE GEORGE EVANS CORPORATION · MOLINE, ILLINOIS

Gentlemen: I wish to know how to cut my clean air maintenance costs in half with a filter that gives lifetime service. Please send me new illustrated catalog.

Name .....

Company .....

Address .....

City ..... State .....

Evans

Lifelong AIR FILTERS

Now WALWORTH *PVC* VALVES and FITTINGS

give you the greater protection and longer service of *all-plastic* piping systems!

The new Walworth plastic Valves and Fittings are made of rigid polyvinyl chloride which is non-aging, non-corrosive and non-toxic and has extremely low flammability and high resistance to chemical attack. Walworth PVC products are molded by General American Transportation Corporation. Each product bears the stamp of Walworth's long established engineering skill and reliability — your assurance of safe, trouble-free valves and pipe fittings.

Walworth PVC Y-Globe Valves are designed to regulate the flow of alkalis, acids, inorganic salt solutions and other troublesome fluids commonly found in food, chemical and allied industries. They will give exceptional service at temperatures as high as 150°F and are designed for use with schedule 80 pipe. Other features of these valves include: (1) Three chevron, Teflon packing rings give you a leak-proof seal without binding the stem. (2) No useless threads to accumulate troublesome dirt because no stem threads enter the interior of the body. (3) Snap-on spherical plug with ball-to-cone seating arrangement to assure a tight line-contact seal between disc and seat regardless of any minor inaccuracies in alignment. (4) Full 45° angle of stem with center line of pipe to reduce pressure drop and turbulence. (5) Generously designed flow passage at the valve seat for a more even flow. (6) Back seat design allows repacking when wide open under pressure. (7) Polyethylene bonnet gasket to assure a perfect body-to-bonnet seal.

Walworth PVC Diaphragm Valves come equipped with neoprene discs. Other diaphragms especially suited to your application can be furnished. "R-2" rubber diaphragms are commonly used in systems handling dilute acids and alkalis. "J-1" Teflon diaphragms are recommended for maximum chemical resistance.

Valve design features: (1) No stuffing box or packing to replace. (2) A resilient diaphragm connected to the compressor by a stud assures a leakproof closure on the body weir or valve seat even when slurries or semi-solids are in the line. Diaphragm easily replaced without removing the valve from the line. (3) Streamlined flow area in valve body makes valve self cleaning and allows fluids to flow equally well in either direction. (4) Separation of valve body from the sealed metal bonnet protects fluids from contamination. Fluids contact only the valve body and diaphragm. (5) Completely enclosed metal bonnet protects stem from breakage and distortion.

Walworth PVC Fittings assure uniform thermal expansion of pipe and fitting threads when used on plastic pipe. They eliminate the danger of jammed threads, loose joints and the chance of galvanic corrosion. These screwed pipe fittings are: (1) Designed for use on schedule 80 of plastic pipe. (2) Walls are of uniform thickness accurately molded. Proportions are skillfully worked out in all sizes and types of fittings. (3) Fittings are chamfered to protect the thread and afford easy entrance of the pipe. Long bands provide reinforcement at the points of severest strain.

This booklet contains all the details about Walworth PVC products that you'll want to know. It describes mechanical and thermal properties, working pressures, sizes and dimensions, application and assembly data. For your free copy write to us. Please use company letterhead.

WALWORTH

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

WALWORTH COMPANY OF CANADA, LTD.

Toronto & Calgary

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

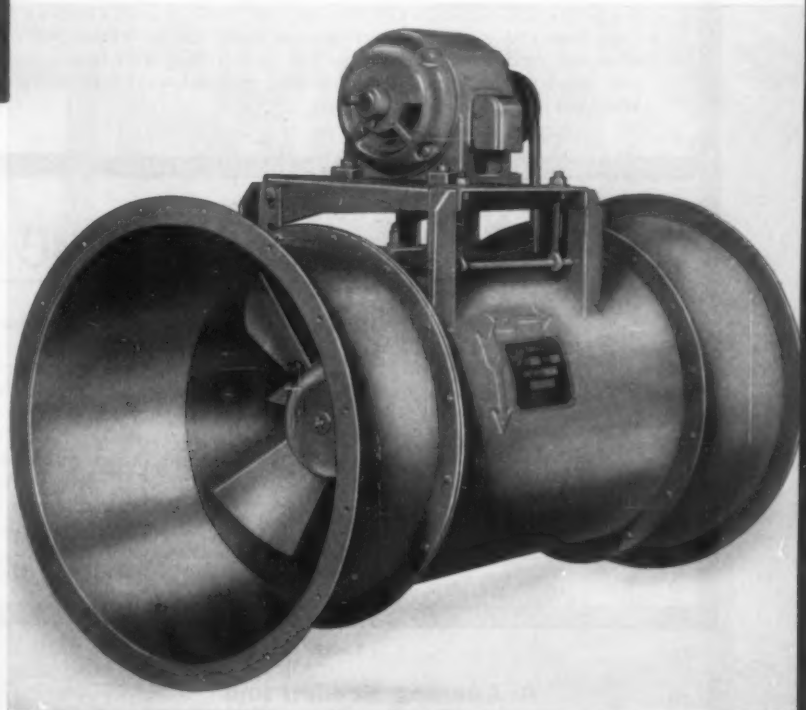
DON'T OVERLOOK JOBS THE AXIAL FLOW DOES BEST!

1. STRAIGHT LINE EFFICIENCY. Being basically designed for duct mounting, the axial flow is at its best when mounted in straight duct runs. "Buffalo" Axial Flows are giving excellent service as duct-mounted "boosters" in systems—also as light-duty ventilation, exhaust and industrial air conditioning supply fans.

2. LIGHT WEIGHT. This permits economical installation. In all but the very largest sizes, no heavy foundations or structural support are required. "Buffalo" Axial Flow Fans are often installed as part of the pipe or stack in hood and vat or other roof exhaust systems.

3. SPACE SAVINGS. These duct-size fans fit in close to walls or ceilings. Space-saving applications vary from paint spray booth exhaust to forced draft for cooling towers — from circulation of chilled air in quick freezing to boiler room cooling. Here, high efficiency influences the choice, as well as compact size.

Naturally, all axial flow fans are not alike. When you specify "Buffalo", you assure your customer the top performance inherent in the "Q" Factor*. Write today for Bulletin 3533-EF for full details.



Right, "Buffalo" Type "B" Vaneaxial Fan. Outlet guide vanes smooth out air flow for greatest efficiency and quiet operation. Available for high or low temperatures, corrosive fumes, explosive atmospheres, etc.

NOTE: No one fan is the answer to every problem. "Buffalo" builds all types, including broad lines of centrifugal and propeller fans. Full details on request.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

171 MORTIMER ST. BUFFALO, N.Y.

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives In All Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

THE ONLY Matched

COOLING TOWERS and CONDENSERS

The Halstead & Mitchell Cooling Towers you select are *matched* by design to work with the famous Halstead & Mitchell water-cooled Condensers. You need no longer buy a high-efficiency cooling tower to work with a low-efficiency condenser (or *vice-versa*) . . . a long-life cooling tower to work with a short-life condenser (or *vice-versa*).

Remember that every cooling tower you sell is planned to work with a water-cooled condenser—then you'll see why America's leading manufacturers of air-conditioning and refrigeration equipment have swung to Halstead & Mitchell for their original equipment needs in both these components.

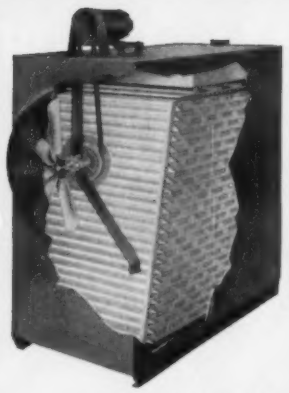
With cleanability you'll sell more. Why sell less?

20-Year Guarantee!

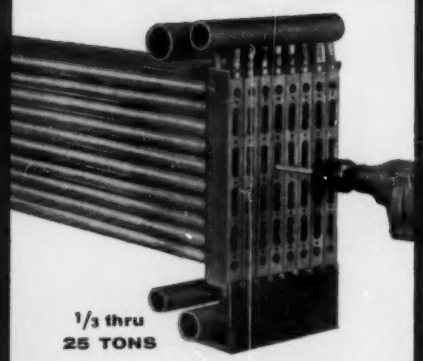
on the wetted deck surface against rotting or fungus attack

Only Halstead & Mitchell pressure-creosoting can provide a *guarantee* against immediate attack by fungus and marine parasites . . . or chemical deterioration from acids in water.

Added to this H&M exclusive are other major advantages. There's ultra-high efficiency in the gravity-type water distributing pan which eliminates extra pumping head required on spray type towers . . . and cuts down on water losses due to "atomizing" of water. And there's extra-long life in stainless steel fans . . . and sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber.



2 thru 120 TONS



1/3 thru 25 TONS

Lifetime Cleanability

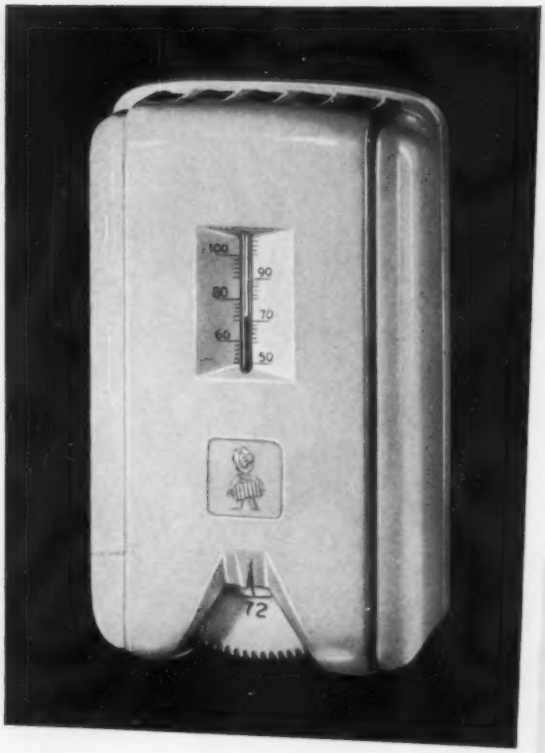
The *mechanical* cleaning of H&M double-tube, counter-flow condensers means the simplest, least dangerous method of restoring new unit efficiency. Whether removing a heavy coating of sludge and scale, or a thin insulating film on the inner walls of the copper tubing, the mechanical cleaning tool restores heat transfer efficiency in a matter of minutes. The result is lowered discharge pressures . . . more heat carried off by cooling water . . . lower bills. *Only* the impurities are removed . . . the thickness of the copper wall remains intact, and the condenser gives extra years of peak service.

At Leading Heating and Refrigeration Wholesalers EVERYWHERE

Write for Detailed Specifications

Halstead & Mitchell

BESSEMER BUILDING • PITTSBURGH 22, PA.



This new Fulton Sylphon Room Thermostat, No. 801 Series, operates within plus or minus ½° of set point. The compact, sturdy design employs a powerful Sylphon Bellows thermostatic unit to provide accurate response to the slightest change in room temperature.

Cable or blanket type panels, wall heaters, suspended unit heaters and portable heaters are accurately controlled by this heavy duty, line voltage type unit. The No. 801 Thermostat can be used also for direct line voltage control of stokers, oil burners and circulating pumps. Use the convenient coupon for complete details.

NEW ROOM No. 801 THERMOSTAT

• For Electric Heating Units • Small As A Switch Plate And Extends Out Only 1⅞" • Rating: 20 amps. (non-inductive load) at 125-250 V.A.C.; ¾ HP at 115 V.A.C. and 1½ HP at 230 V.A.C. • Easily Installed • UL Approved

FROM FULTON SYLPHON TEMPERATURE REGULATOR HEADQUARTERS, U.S.A.

Mr. Controls

Robertshaw-Fulton CONTROLS COMPANY

FULTON SYLPHON DIVISION

FULTON SYLPHON DIVISION

Knoxville 1, Tennessee

Please send me a copy of the new Room Thermostat Bulletin 801.

Name_____

Company_____

Address_____

City_____ State_____

Over 80,000 operations with these Crane valves
Maintenance cost: zero

THE CASE HISTORY—More than 6 years of long-day service—with not one penny of maintenance cost to date! That's the record for Crane valves on these Market Forge steam cookers in Chicago's world-famed Conrad Hilton hotel.

Operated an average of 35 times daily, each of the 24 quick-opening Crane brass gate valves on this installation keeps handling the flow of steam with highest efficiency.

Their cam and lever action remains smooth and positive. They open wide without flow restriction . . . they seat tightly, with no appreciable seat wear or erosive effects. There's no leakage through the cap joint or around the operating mechanism.

The Market Forge Co., Everett, Mass., finds these Crane No. 432 quick-opening valves well adapted to its famous cookers. It's a case of protecting a good product with quality equipment and giving buyers added value. The Conrad Hilton's experience is duplicated wherever these cookers are installed.

Whether you use quick-opening valves as machinery components or in plant service piping, you'll find Crane quality designs for all your needs. Crane makes them in gate and globe types, in brass and iron—for steam, water, oil, gas, air, gasoline, etc.—in a wide range of sizes. Your local Crane Representative can give valuable help in selecting these valves for your specific needs.

Crane Co., General Offices, Chicago 5, Ill. Branches and Wholesalers serving all areas.

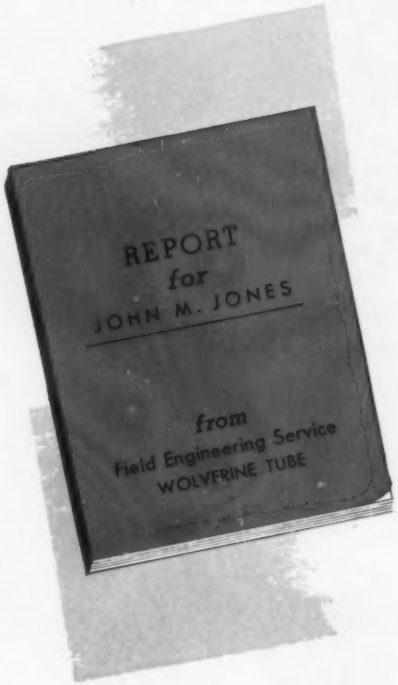
CRANE CO.

for the THRIFTY BUYER

VALVES • FITTINGS • PIPE
KITCHENS • PLUMBING • HEATING

CRANE'S FIRST CENTURY...1855-1955

FAMOUS FOR QUOTATIONS



"TO ACCEPT GOOD ADVICE IS BUT TO INCREASE ONE'S OWN ABILITY"

GOETHE

. . . and good advice from competent, highly trained tubing technicians is exactly what Wolverine customers get when they bring a problem to Wolverine's Field Engineering Service. If, for example, the problem concerned aluminum they would receive information on alloys, fabrication, applications.

Wolverine's aluminum products—tubing and extruded shapes—are the result of years of metalworking experience. They are available in popular alloys, are held to rigid tolerances, will meet the most exacting specifications.

Remember that Wolverine, too, is famous for quotations. Ask for one before placing your next order for aluminum tubing or extruded aluminum shapes. Write for your copy of the Wolverine Aluminum Catalog.

WOLVERINE TUBE, 1461 Central Ave., Detroit 9, Mich.

WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

MANUFACTURERS OF QUALITY-CONTROLLED TUBING AND EXTRUDED ALUMINUM SHAPES

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES.

EXPORT DEPT., 13 E. 40TH ST., NEW YORK 16, N.Y.

4606

Safe, Tight ...Trouble-free

. . . with *union* body-bonnet joint on 125 lb., 150 lb., 200 lb. pressure classes

Be safer—and save! Greater operating safety, positive shutoff, and low upkeep costs are the prime advantages of modern OIC bronze gate valve designs in all pressure classes.

Union ring nut provides safety-tight body-bonnet joint

The separate union nut seals the bonnet and body mating surfaces, effecting a tight, leak-proof joint. Possibility of distorting body and bonnet during disassembly and assembly and of loosening the joint during operation are virtually eliminated.

OIC design reduces maintenance costs

Necessity for stem replacement can be forgotten, because stems are special, long-lived OIC *Alloy-40*. This sturdy material eliminates galling and seizing and contributes to easy operation.

Stem threads are never exposed to line fluids in open or closed positions (125 lb. and 150 lb.), preventing thread abrasion from line fluids or suspended solids.

All pressure parts are designed for maximum strength, and working parts are hydrostatically tested for positive sealing and seating. Write for our folder, No. 1006.

Order from your OIC distributor.

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

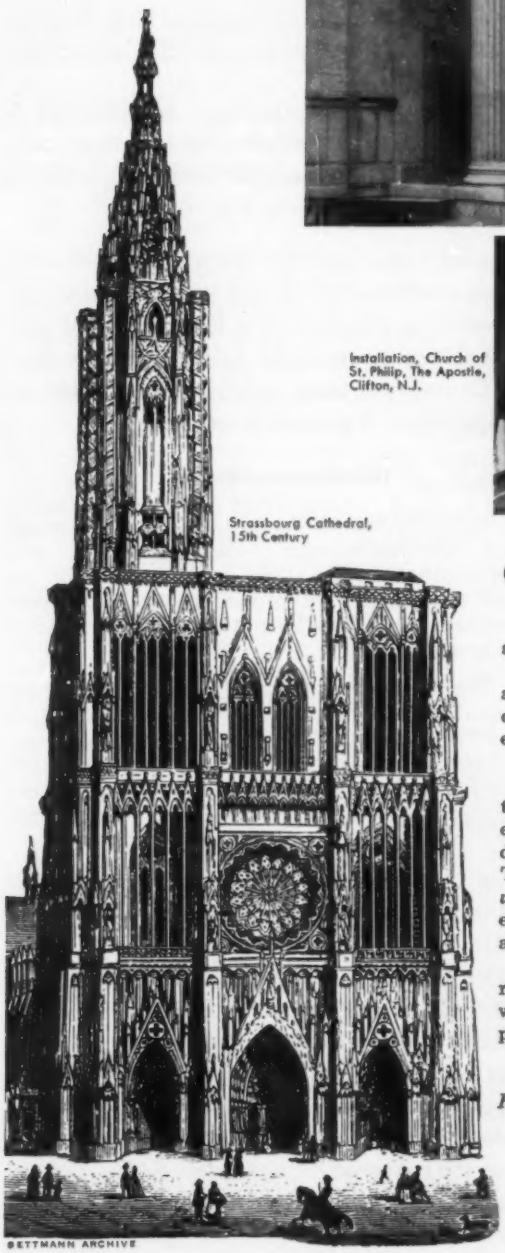
VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES**

St. Ann's Church
Cleveland Heights, Ohio

The Vivian Webb Chapel, Claremont, Cal.

St. John's Church, Delphos, Ohio

Installation, Church of St. Philip, The Apostle, Clifton, N.J.



Strassbourg Cathedral, 15th Century

BETTMANN ARCHIVE

COMFORT GOES TO CHURCH

Throughout the ages the nobility of man has found no higher expression than in the beauty of the world's churches, temples and cathedrals.

But the majesty of a fifteenth century cathedral, with its lofty spires and delicate filigrees of stone, is no more wondrous than its modern counterpart of perhaps lesser artistry but far greater *comfort* that encourages attendance at worship.

Yes, *comfort* goes to church, now . . . and so do millions more people.

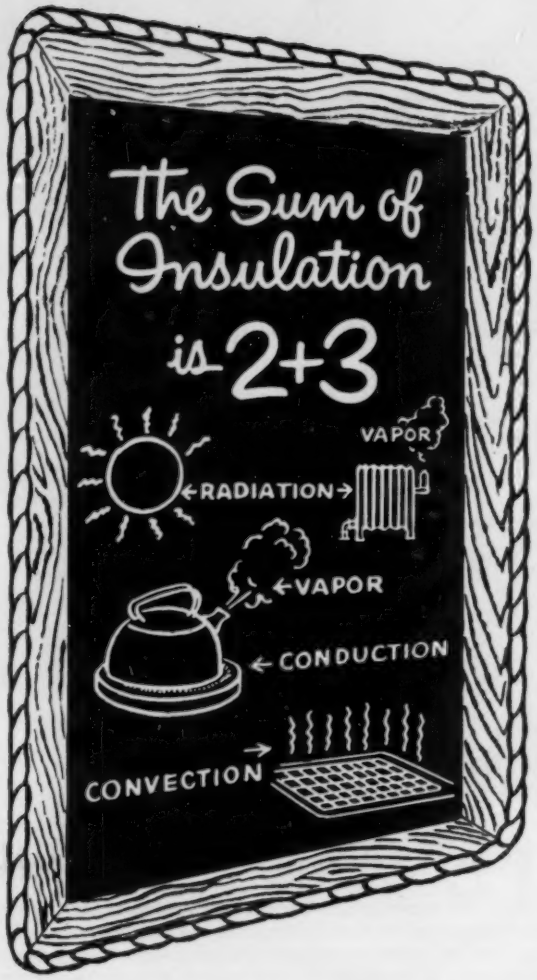
One of the greatest advances in achieving church comfort has been the widespread adoption of radiant heating. For no heating is quite as effective as the gentle, all-permeating, sun-like warmth . . . without drafts, currents, or dead spots . . . achieved by modern radiant heating. Today's church designers know that radiant heating, which assures *utmost* comfort and health protection for both the very young and the elderly groups within congregations, is also ideally suited for every other age of worshippers.

They know, too, that *steel pipe* is the most accepted medium for radiant heating systems . . . in fact, the most widely used pipe in the world for heating, plumbing, snow melting, fire sprinkler systems, and power, steam and air transmission.

Send for your free copy of the 48 page color booklet "Radiant Panel Heating with Steel Pipe" and let comfort go to your church, too.

Steel Pipe is First Choice

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N. Y.



COST OF EDGE-TO-EDGE INFRA
Multiple Aluminum Insulation installed in new construction between wood joists, material and labor

Type 6-PS about 10¢ sq. ft.
Type 4-PS about 8¢ sq. ft.

Infra Insulation, Inc., 525 B'way., N. Y. C. Dept. H-12
Please send sample of new insulation ☐; Bureau of Standards Report "Moisture Condensation in Building Walls"–BMS63 ☐

Name_____

Firm_____

Address_____

FIVE-WAY protection is required of an insulation against (1) CONDENSATION, (2) VAPOR FLOW, as well as against Heat Flow by (3) RADIATION, (4) CONDUCTION, (5) CONVECTION.

Multiple accordion aluminum provides this 5-fold protection. It is pre-fabricated to automatically create a "blanket" of multiple alternating layers of air, aluminum and fiber as it is installed.

Against RADIATION there is high (97%) reflectivity, low (3%) absorptivity and low (3%) emissivity for heat rays. CONDUCTION is low because of preponderant compartmented air spaces of low density. CONVECTION, outer and inner, is retarded by multiple layers of aluminum and fiber.

CONDENSATION MINIMIZED

There is now a new*, multiple aluminum, which forms a *continuous*, edge-to-edge "blanket" of uniform depth between studs or joists, giving the entire area maximum protection against vapor-flow and condensation formation as well as against heat loss or intrusion.

The aluminum sheets, 375 ft. to 750 ft. long are almost impervious to water vapor. Infiltration under the flat stapled flanges is slight. Condensation formation, on or within this type of insulation is minimized because of the scientific construction of multiple layers of aluminum, fiber, and air spaces.

The U. S. NATIONAL BUREAU OF STANDARDS has published an informative and authoritative report on "Moisture Condensation in Building Walls." This booklet explains the conditions under which condensation will take place in insulated as well as uninsulated walls; what part is played by effective vapor barriers such as metal foils; how to use and interpret thermal-resistance and vapor-resistance fractions. You can obtain it at our expense by sending us the coupon.

*Patent applied for.

Business Next Year to be Better Than in 1955

. . . leading economists predict

BUSINESS next year will be even better than this year, with greater output, higher wages, and higher prices in prospect, according to the forecasts of 201 leading economists polled by F. W. Dodge Corp. in its annual survey. Gross national product is expected to reach a peak in the middle of 1956, but there will be a slight downturn in the second half. A similar pattern shows up in the forecasts for the Federal Reserve Board's index of industrial production.

In previous polls this panel accurately foresaw the mild downturn of business in 1954 and the upturn in 1955, says Dr. George Cline Smith, Dodge economist.

The panel expects next year's total new construction to be about $41 billion, a slight decrease below the estimate of $42 billion for this year. ⫩

Banker's Trust in N.Y. To Be Air Conditioned

. . . central plant totals 2300 tons

THE 31 story Bankers Trust Co. building, a major Wall St. structure, is to be air conditioned by a year 'round central system, according to the Carrier Corp. Under the current contract, only the second through twelfth floors will be air conditioned, an area of 270,000 sq ft. Air conditioning of the remaining spaces will be done in stages.

The 2300 ton plant is believed to be the largest ever installed in an existing building in the New York area. Three centrifugal cooling machines in the fifth sub-basement will provide sufficient refrigeration capacity for the entire building. The structure includes a 24 year old addition 25 stories high, as well as the 45 year old tower section.

Steam, used as the source of heat in winter, will be employed during the summer by turbines to drive the centrifugals.

Unique Magazine Rack Keeps HPAC Issues Handy

A MAGAZINE RACK designed especially to hold a whole year's issues of HPAC has been presented to us by Edwin F. Smith, engineer, Prospect Park, Pa.

Each individual rack is constructed of 0.040 in. thick sheet steel, bent 90 deg and mounted on two dissimilar shape pieces at an angle suited to hold the magazines in proper shape. The rack measures 8¼ × 8¼ × 7 in.

Mr. Smith — see photo — made several of these racks to maintain his files of HPAC in good condition and readily accessible for reference. He has his issues complete from 1942.

The weight of the magazines is carried by the holder shelf largely. Because the shelf tilts in two directions, each magazine leans against the next and toward the bound edge. Thus, they will not develop a bend to the lower open edge, falling over on the shelf, as would be the case if they were just stacked vertically on a level shelf.

We thank Mr. Smith for this handy gift and congratulate him for his ingenuity. He reports that he has made racks for other readers who keep their issues for reference. ⫩

HE'S ALIVE . . . AND YOU HELPED
Tuberculosis is the most destructive disease the world has ever known. In the U.S. alone, there are 400,000 persons with active, infectious cases. Let's help defeat TB. The annual Christmas seal says "somebody helped."

Consulting Engineers Study New Organization

. . . at St. Louis meeting

REPRESENTATIVES of the Consulting engineering Associations of California, Minnesota, Ohio, Texas, Chicago, New York City, Washington State, Oklahoma, and Missouri met on October 28 and 29 to consider the formation of a federation of the state and city associations now in existence.

Committees were appointed to study the matter and to draft proposals for consideration at the next meeting, to be held in 1956.

Other items under consideration were mutual problems involving competitive bidding, unfair competition, setting fees, and other aspects of professional ethics and operation facing consulting engineers in private practice. ⫩

Atomic Piping Standards Increase in Difficulty

. . . tolerances, cleanliness problems

"PIPING DESIGN and installation in atomic energy installations must take into account the requirements for remote maintenance," declared A. M. Gegenheimer, of the Blaw-Knox Co., in a speech at the atomic energy forum of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry, held recently at Purdue university.

"Flanges and specially designed connectors are so located that a section can be removed by remote control with a minimum of difficulty. This requires jig fabrication to a few thousandths of an inch tolerance in all planes so that parts may be interchangeable. Instead of working to 1/16 in. as is common in pipe fitting, you are now required to work to 2/1000 or 3/1000 in. More and more piping will be jig fabricated, as the use of atomic energy progresses. . ."

"Materials of construction have not changed a great deal with the advent of atomic energy," he said. "But in these same common materials, reactor installations have made us painfully aware of different grades and types. We all know that carbon steel comes in Schedules 40, 80, 160, but how many are familiar with the classifications ASTM-A53, ASTM-A106, ASTM-A333 and grades of A-B or C?"

Mr. Gegenheimer pointed out the difficulties and precautions involved in the installation of a piping system that must be "hospital" clean. "Can you picture a pipe fitter wearing white gloves to work? It has been required on some projects. Such a little thing as handling material with the bare hands that may have been washed with a soap containing certain elements, may determine whether a reactor goes on stream with or without difficulty. . ." ⫩

HPAC Index for 1955 Available Soon

. . . for free copy, write editor

FOR YOUR convenience the editorial contents of HPAC, including the Journal Section of the American Society of Heating and Air-Conditioning Engineers, are indexed annually. The 1955 index is now in preparation and will be available early in 1956 to subscribers on request.

To obtain your free copy, write the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Ill. ⫩

New D. of C. Rules on Electrical, Piping Work

. . . set "boundaries"

"BOUNDARIES" within which refrigeration contractors and mechanics can legally work have been established by recently enacted regulations concerning licensing in the District of Columbia.

The regulations, proposed by the Refrigeration Trade Association in November 1953, were acted upon by the District after considerable study and two public hearings. Besides the District of Columbia, the State of North Carolina has adopted the rules.

The rules provide that qualified contractors and mechanics may work on the electrical components of an installation from a disconnect switch, and on the piping components from a hand shutoff valve to a trapped drain, as well as on other components which are not reserved to other specifically licensed trades.

The new regulations do not preclude other licensed trades from performing work in their respective categories. ⫩

HPAC Directory Section Coming in January

. . . thoroughly revised

THE JANUARY HPAC will contain the 22nd annual Directory Section of Heating, Piping, and Air Conditioning Equipment for Industrial, Commercial, Institutional, and Public Buildings.

Thoroughly revised and up to date, the 1956 Directory contains complete product classifications, trade names, manufacturers' addresses, and an additional product classification of all equipment on which information is given in the advertising pages of the same issue. ⫩

Martin P. Durkin Dies; Worked to Improve Craft

. . . rose from humble start

MARTIN P. DURKIN, former Secretary of Labor and general president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry since 1942, died in Washington, November 13 after a long illness. Two brain operations in 14 months had failed to improve his condition. He was 61.

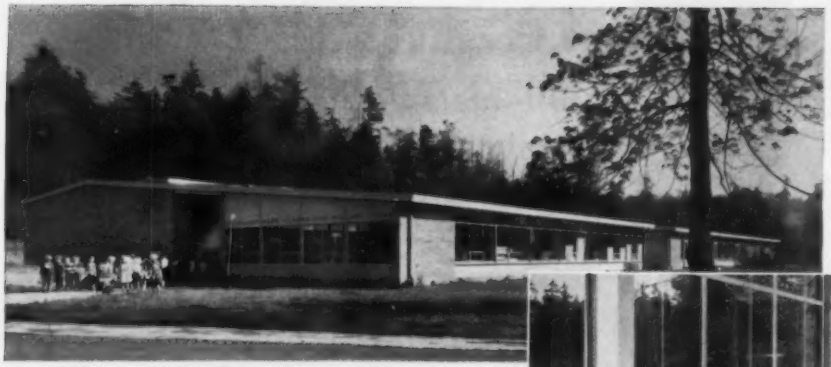
Mr. Durkin was born "back of the yards" in Chicago. After working in a meat packing plant, he became a steamfitter's helper, then a journeyman and later a union official.

In 1933 he was made head of the Illinois Department of Labor.

During World War II and following, he sought to improve the standards of his craft. He strongly supported the apprentice training program, including the annual conference and contests, which have been reported by HPAC with keen interest. ⫩

"Quote"

"Hours spent in writing may well prove to be an engineer's most productive time. Moreover, from a selfish standpoint, the engineer or scientist who can do an effective job of communicating his ideas to others—particularly to those in management—usually advances up the professional ladder somewhat faster than his colleagues who have not acquired this ability." ***From an article by Ralph A. Richardson, Research Laboratories Div., and C. A. Brown, General Motors Institute, in General Motors Engineering Journal, September-October 1955.***



Normandy Park Elementary School, of the Highline School District, near Seattle, Washington, now accommodates 300 pupils, has an ultimate capacity of 500. Architects: Waldron & Dietz. Mechanical Engineers: Stern & Towne. Heating Contractors: University Plumbing & Heating Company.

Photographs by Dearborn-Massar

Classroom with Custom Webster Walvector behind plywood panels.

MODERN 10-ROOM SCHOOL—$228,000

Waldron & Dietz, Seattle architects, designed new Normandy Park Elementary School. Tru-Perimeter Forced Hot Water Heating with Webster Walvector was economically installed, provided heating comfort at low fuel cost.

Note Standard Webster Walvector along corridor wall; Custom Webster Walvector behind plywood in the classroom, heating both recirculated and fresh air. Walvector's fin-tube heating element carries forced hot water along all exposed walls . . . spreads clean, gentle, even warmth . . . no cold spots, hot spots or drafts.

Four units will comprise the finished school. There will be two classroom wings, only one of which has already been built. Units are separated to avoid need for fire walls and fire doors, but are connected by open passages. Exterior and interior finishes are inexpensive, and skylights are simplified. Construction costs were held to $10.88 per sq. ft., or $760 per pupil.

Investigate the heating design economies of Tru-Perimeter Webster Walvector for *your* school. See your Webster Representative or write us.

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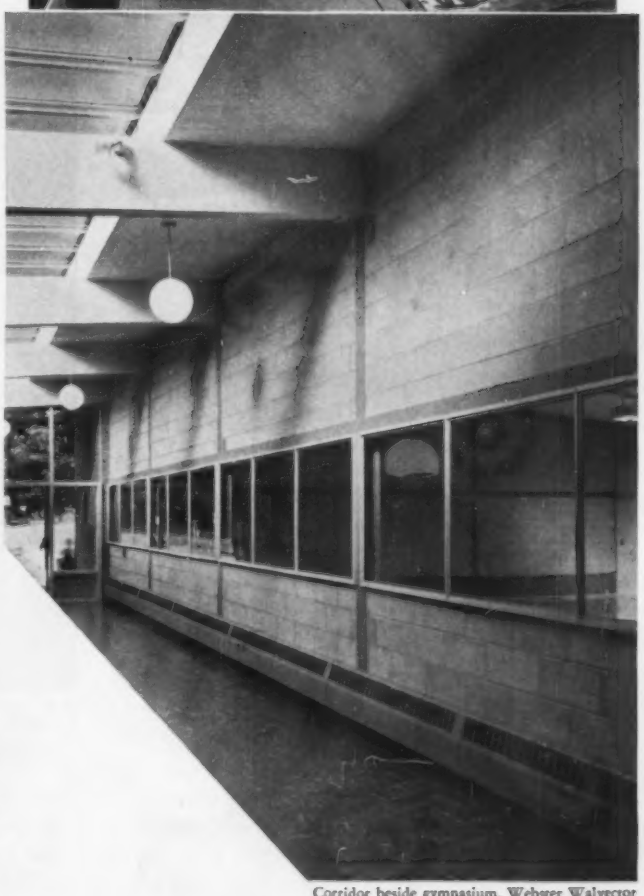

Corridor beside gymnasium. Webster Walvector keeps corridor warm, even when gym is unheated and unused.

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Today's most versatile form of perimeter heating is the dependable ally of designers and builders of churches, schools, hospitals and offices

Sill-line fits this structural condition with ease and grace

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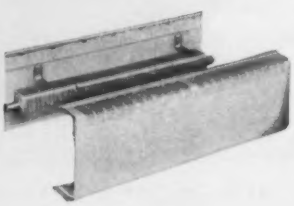

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Only Nesbitt Sill-line Radiation with its full one-piece back could fit with economy this mullioned wall-skin construction

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"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Economics, Practical Design Aspects Govern Grouping of Air Compressors

IN THE October HPAC the question, *How Can We Group Air Compressors?*, was answered quite satisfactorily, in my opinion.

Actually, two questions were asked. First, is it practical to consolidate two compressor plants that are at present completely installed and operating? Second, how may these be grouped and piping arranged in a single plant?

To answer the first in one sentence, one must determine whether compressed air in proper quantity—*at the point of use*, not at the compressor plant—can be supplied in a consolidated plant at sufficiently lower cost to pay the expense of consolidation within a reasonable period of time. Individual factors that might decide this are:

1) The utility of compressed air depends wholly upon its ability to enable a man to produce more with less effort in a given period of time. Almost without exception, the amount a man can produce is dependent upon maintenance of air pressure where the compressed air is being used. The minimum that should be considered satisfactory at this point is about 90 psig.

The distance from the centers of use in the present location as opposed to the distance of the centers of use from the new location and the relative adequacy of the distribution system are also important factors. If better distribution can be obtained by consolidating, then there can be better assurance of maintenance of adequate air pressure at the points of use. Then there is very definite economic advantage to consolidation.

2) The cost of such consolidation of two plants would be considerable. This expense must, of course, be paid back by savings obtained within a reasonable time.

3) In connection with these savings there will possibly be a reduction in cost of operating supervision. Eleven units requiring 3200 hp is a large compressed air plant and some reduction in operating personnel in consolidating from two plants to one might be possible.

4) There may be a reduction in power cost obtained through better adjustment of units to the demands made on them. Modern capacity control is efficient, but machines should not be run unless they are needed to carry the load. It is possible that an improvement can also be made in the present operation of two plants by interconnecting them and operating them as a unit with scheduling of operating units controlled from a central point based on the expected and the actual demand at various times.

With regard to the second question on how to group and arrange the piping, the layout depends on so many factors which are unknown to myself that extended comment is hardly possible. The following points, however, should give something to work on.

1) Each unit should be arranged so that it can be operated individually. It must be possible to start and stop it, and connect it to the plant system or disconnect it without influencing any other machine.

2) The most economic units should generally be arranged to operate on practically a base load. Their capacity control or regulation should be set to operate at a higher discharge pressure.

3) The less economical and smaller units should be arranged for operation only as needed. Their control should be set at the lower pressures to take the normal plant load swings.

4) Preferably, install each unit with its own aftercooler and receiver.

The Compressed Air Handbook, sponsored by the Compressed Air and Gas Institute, contains considerable helpful information on this subject and on compressed air generation and the use of compressed air in general. Also, a booklet, *A Better Air Power System*, is available from my company for the writing.

C. W. GIBBS
Compressor Engineering Dept.
Ingersoll-Rand Co.

Proposed Thermal Efficiency Rating Recalls Earlier Bid For Standards

WE ARE very much interested in the article, *What We Need Is an Efficiency Rating for Evaluating the Thermal Qualities of Any Building*, by Professor F. W. Hutchinson, in the March HPAC. The purpose of the standard proposed by the author very closely resembles the one we proposed some time ago.

Ours was published in the October 1943 issue of the Bulletin of the National District Heating Association. We have tried since to create interest in the adoption of this type of standard.

The primary purpose of our method is to provide a way of determining building heat requirements that provides for consideration of as many appreciable factors as necessary — and only that many. The fact that accurate information regarding some factors is not available and that accurate measurements for use of other factors is sometimes difficult or impossible to obtain, need not and should not prevent utilizing available and obtainable information to the fullest advantage.

The method is elastic enough to provide for use of more accurate data as it is obtained. Additional factors that may be found which have a marked effect on heating requirements would need no change in calculation.

Factors which determine the heating requirements of any building are grouped under three classifications, namely: (1) the effect of outside conditions, or where the building is; (2) the effect of construction, or what the building is made of and how it is made; and (3) the effect of inside conditions, or how the building is operated. In determining annual requirements, only the factors affected equally by inside and outside temperature differential are multiplied by degree days.

Close agreement between calculated and measured fuel consumption for a building should be a good indication that there is efficient, uniform operation of the building and its heating system. Such agreement may be difficult to obtain in a building not equipped with an automatic temperature control system. Composite average temperature might be more difficult to evaluate accurately and ventilation loss due to open windows might be little more than a matter of guesswork.

Methods now recommended for computing or predicting heat requirements tend to be uncoordinated, cumbersome, and incomplete, generally. Therefore, many engineers use only total building exposed surface, volume, or radiation. Methods requiring detailed calculations often involve use of gross maximum or design values instead of net average values. Such methods present an incomplete and distorted analysis of conditions.

For instance, many estimators in analyzing a well constructed and well heated building might say that 18.5 percent of the total heat loss is through infiltration and then compute the saving by weatherstripping on that basis. Actually, infiltration is 18.5 percent of the hourly design heat loss but only 6.2 percent of the total annual loss.

Unwarranted emphasis apparently is given the infiltration portion of total heating requirements in many buildings. This probably may be accounted for by the following:

1) Use of design velocities rather than average velocities.

2) Possible extreme variation in average crack thickness and clearance for different windows of the same type.

3) Overlapping or duplication of infiltration and ventilation losses.

4) Failure to consider that lowest infiltration rates usually correspond with the lowest daily outside temperatures, which occur during the night.

5) The fact that winds frequently do not blow from a straight north, south, east or west direction while building walls are invariably exactly normal to these directions. Turbulence caused by the angle of incidence reduces the rate of infiltration as compared with that at a normal angle.

6) Lack of data regarding the net effect of the six factors mentioned in the 1944 Heating, Ventilating, and Air Conditioning Guide upon total air displacement in buildings.

7) Repeated emphasis of the obvious impossibility of measuring infiltration with a reasonable degree of accuracy in some buildings, such as garages, in which infiltration is a large portion of the total loss.

8) Continued use of rule of thumb methods for estimating infiltration. Infiltration at not less than one air change per hour has long been used for buildings with single, nonweatherstripped windows. This is equivalent to 3,732,480 Btu per season per 1000 cu ft of volume for a 270 day, 40 F average temperature heating season, with 72 F average inside temperature. Application of this figure to many commercial buildings results in 100 percent of the annual heating load due to infiltration.

Recognizing that air leakage usually is between the limits of 5 and 35 percent of the total heating load the following factors should be considered:

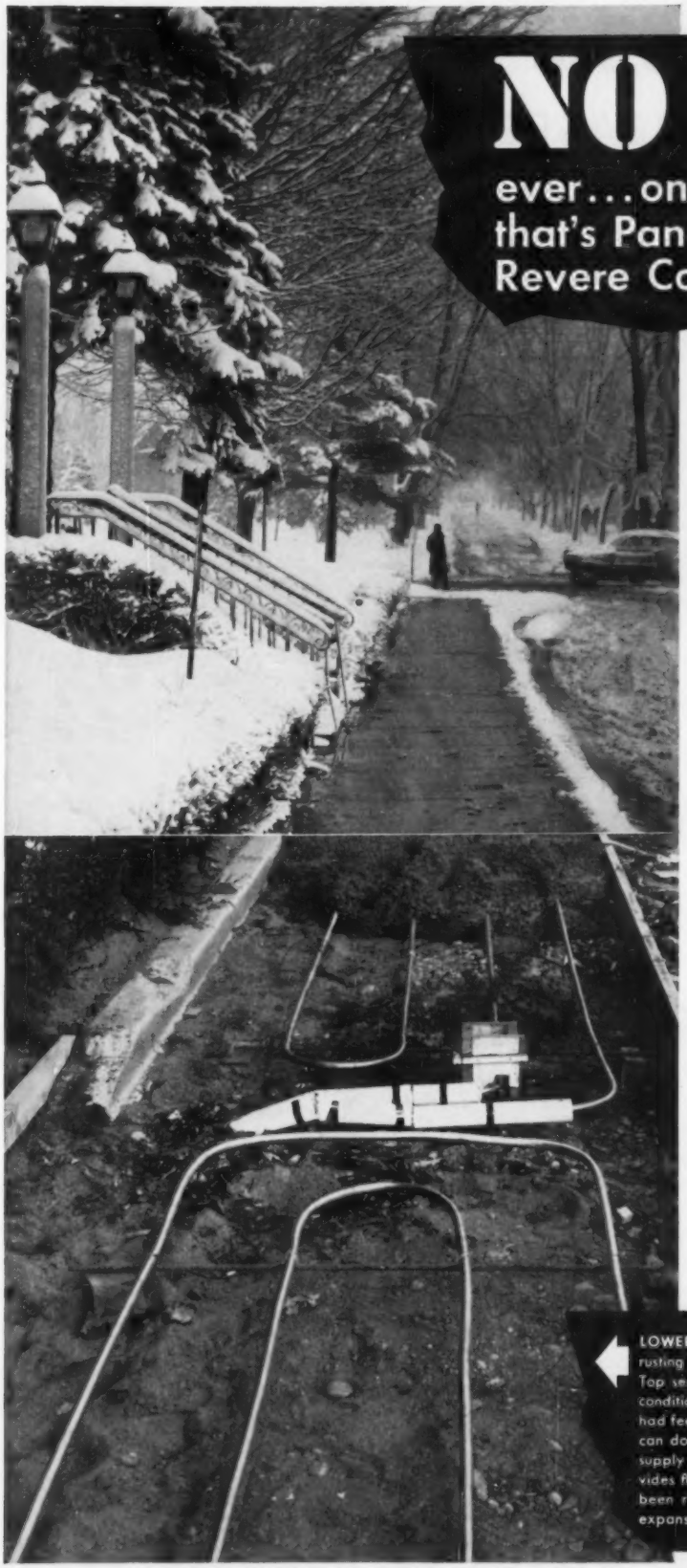
1) Changing the position of a single damper can vary the ventilation load over 1000 percent and the total heat requirement as much as 100 percent in some buildings.

2) Inside heat gain can affect the total heating load more than 50 percent and direct heat from the sun can affect it as much as 20 percent, yet neither are included in methods recommended for determining fuel consumption or in specifying the degree day base of 65 F.

More data is needed on all phases of air leakage, effect of solar radiation on total heat consumption, proportionate effects on total volume of air flow through various type dampers at various positions with various types of fans, average wind velocities from sundown to sunrise or from 6 p.m. to 6 a.m., and rate of inside heat gain corresponding to the degree day base of 65 F.

The fact that several different factors are still subject to appreciable error should not prevent provision of a method for using what information is available, when it is available, as accurately as possible.

R. A. Parsons
Board of Water &
Electric Light Commissioners
Lansing, Mich.



NO SNOW

ever... on the sidewalk that's Panel Heated with Revere Copper Water Tube

Huge strides are being made by this method of snow removal. No wonder, shoveling and accidents due to snowy walks are eliminated . . . while the time and labor saved pays for the installation in short order.

That's why you'll find snow melting panels also being used on driveways, loading platforms, entrance aprons, service stations, pedestrian ramps at railroad stations, airports and similar spots. One application which bears special mention is the use of coils in garages. They quickly melt the snow on cars, keep floors dry as well as keep the repair shop floors warm so mechanics can lie right on the bare concrete in comfort.

And when you make the panels of Revere Copper Water Tube you have these added advantages: Copper can be bent to conform to the terrain. Bendability permits use of sinuous coils, while the 60-foot lengths of tube mean fewer fittings which, when joined by solder means joints that stay tight. Copper tube cannot rust, rot or deteriorate. That's why, on the inside, full flow and low frictional resistance are maintained throughout its long life. While external moisture will not harm it from the outside.

Keep ahead of the parade. Recommend Panel Heating for snow removal. Revere's Technical Advisory Service will be glad to help you in the proper application of Revere Copper Tube in working up your plans.

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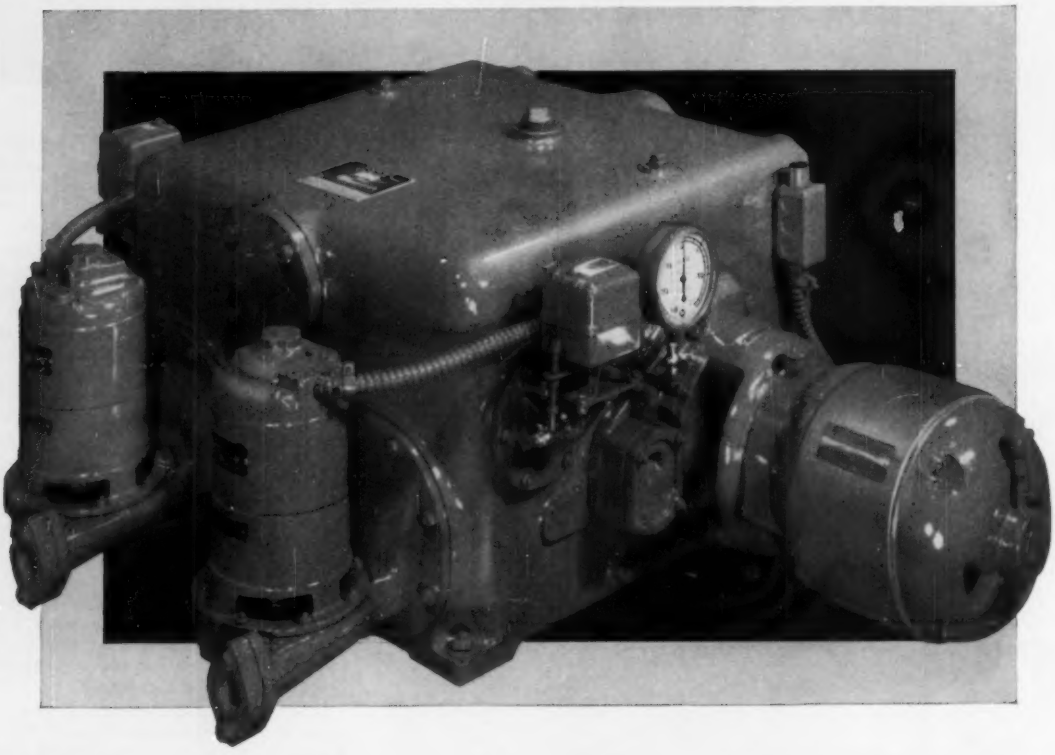
LOWER SECTION OF PHOTOGRAPH shows how non-rusting Revere Copper Tube was imbedded in concrete slab. Top section of photo shows same walk under actual snow conditions. Note bends. Think of all the joints necessary had ferrous pipe been used. And think, too, of what seepage can do to rustable materials. Note insulation used on each supply and return line to the coils from the mains. This provides flexibility in the take-offs from the mains, which have been run below the slab, to allow for movement due to expansion and contraction.

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.

MODERN ENVELOPE PLANT, practically windowless, has year 'round temperature and humidity conditioning for storing paper and process piping for making gums

New Process Piping Plant Gets Tailored Environment

By Robert Solmor
Charles Simkin & Sons, Inc.
Engineering Contractors

. . . world's largest envelope manufacturer's new adhesives plant equipped with $370,000 heating, ventilating, air conditioning, and process piping installations

U. S. Envelope Co.'s spacious new plant at Metuchen, N. J., is one of the most efficiently "climatized" units of its type in operation. This latest addition to the firm's coast to coast family of 15 is equipped with year 'round temperature and humidity conditioning and with process piping for filling many unique requirements.

Adjoining the plant proper, with its 100,000 sq ft of floor area filled with high speed automatic equipment, are batteries of deep vats and powerful agitators for preparing and blending 30 types of glues and emulsions.

With the company entirely dependent on this single processing center for adhesives, special efforts were devoted to devising and installing chemical handling equipment, controls, pumps, ductwork, and piping that would support the gum making operation at maximum efficiency, economy, and longevity. At the same time, provision for reducing to a minimum the occasional shutdowns for normal maintenance was also planned. Because of the nature of the chemicals handled, extensive welded stainless steel pipe lines, stainless steel pumps, and coated wooden ducts, held together by stainless steel screws, were installed.

Two independent package air conditioning systems — 7½ and 15 tons, respectively, with a combined capacity of 9000 cfm and 293,000 Btu per hr heat removal — are installed in the general and laboratory office areas. Both units operate noiselessly on vibration eliminator bases and are equipped with throwaway filters.

Design criteria require that a constant 80 F dry bulb temperature and 50 percent relative humidity be maintained in air conditioned spaces when outdoor temperatures are 95 F dry bulb and 75 F wet bulb.

Ventilate Factory in Summer

Summer heat is dispelled in the factory area by a ventilating system which combines blower type unit ventilators, propeller and centrifugal exhaust fans, and roof air intakes into a coordinated air evacuation scheme that can move over 292,000 cfm at peak output. Balanced and baffled ventilation does an efficient job in removing building heat and reducing indoor temperatures to pleasant levels. Employee morale and productivity is high.

During the winter months, heat is directed over the factory areas through unit heaters which are supplied by a 15 psi steam line. These unit heaters are controlled by electric thermostats.

The blower type unit ventilators, which incidentally take only 100 percent outside air, of course operate without heat during the summer months. For winter operation, the system fed heating coils are sized only to heat the incoming air from zero to 70 F. These unit ventilators

are controlled by self-contained temperature regulators, with the bulbs set in the discharge air plenum.

Two package 150 hp Scotch marine boilers of the four-pass fire tube type, operating in rotation, generate steam for indoor heating requirments.

Another set of automatic package boilers, operating alternately, generate steam at 50 psi for the various gum making processes. Both high pressure units are rated at 50 hp. A strong likelihood of expansion in the not-too-distant future prompted the company to choose a system rated at 125 psi for process steam scaled down to 50 psi, which takes care of current needs.

Both high pressure units and their companions in heating service burn No. 6 fuel oil from horizontal rotary burners. They are fully equipped with modern automatic controls, electronic safety controls, and auxiliaries to maintain constant, dependable operation with good fuel economy.

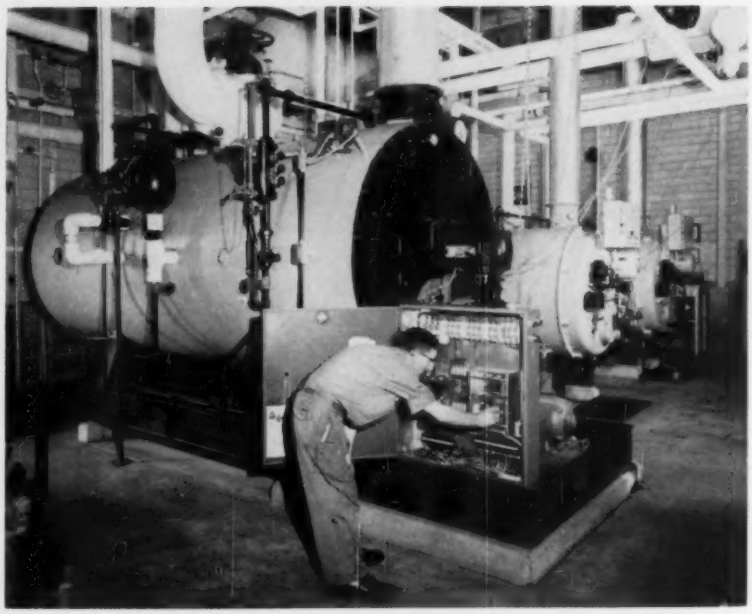
The fuel oil tank installation is comprised of two 15,000 gal fuel oil tanks, with a water to oil heating convertor in each tank. A separate hot water heating system, with circulator and controls, is used to heat the No. 6 oil in the tanks before it is pumped to the boiler rooms.

Hot water circulating systems were designed specifically for the office areas. The system, complete with convertor, circulating pumps, expansion tank, radiation elements, and accessory components was installed with a steam modulating control that automatically schedules indoor temperatures with sensitivity and precision. A two-pipe hot water heating system with finned tube radiators serves the laboratory and solvent storage areas.

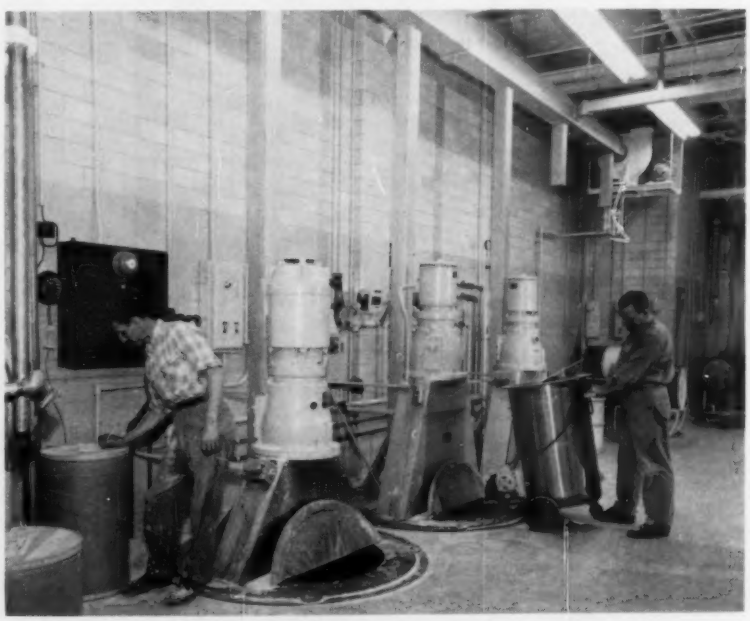
Paper Room Air Conditioned

Also in the building is a paper testing room requiring constant temperature and humidity. This room is conditioned by means of a 3 ton condensing unit and an air handling unit with heating coils and a humidifier. Elaborate electric controls for this room are constantly verified by a temperature and humidity recorder. ⧺

. . . adhesives plant conditioned for

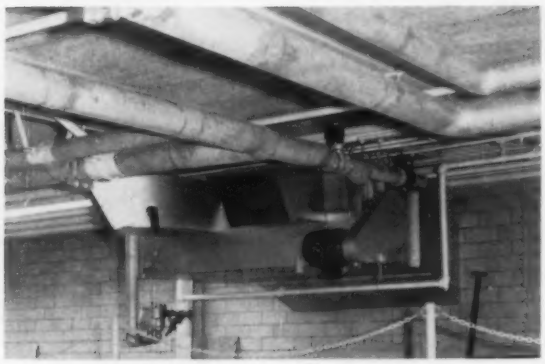


CONTROL BOX of a 150 hp low pressure heating boiler is opened for inspection of the electric flame failure control. The boilers at the right generate high pressure steam for gum making



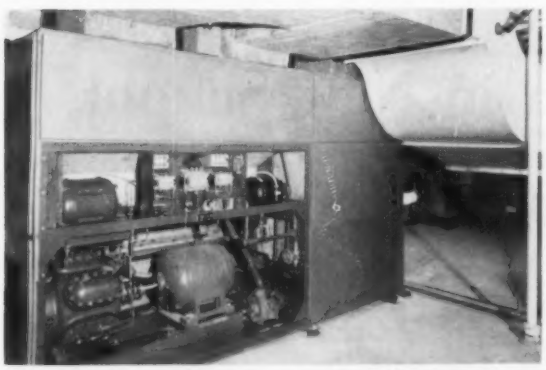
MAIN GUM ROOM, which produces up to 12,000 lb of dextrin and glues per day, has a unique system of wooden ducts to exhaust corrosive vapors

process and comfort

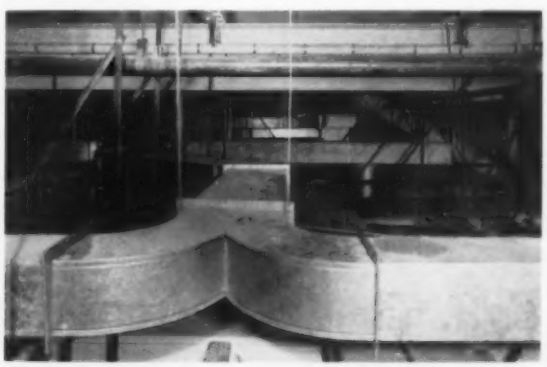


BLOWERS, HEATERS, AND VENTILATORS each deliver 9000 cfm. This horizontal unit is belt driven by a 2 hp motor and is controlled by a modulating valve in the steam circuit

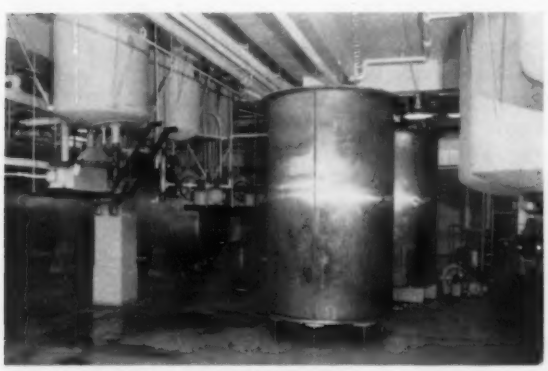
PENDANT TYPE VENTILATORS, uniformly spotted across the plant, withdraw and expel exhausted air through roof exits. The high volume induced draft system has no blind spots



AIR CONDITIONING UNITS are central station types totaling 32½ tons. Their sounds are dampened and their vibrations isolated from the office areas



AIR CONDITIONING AND HEATING DUCTS, between the roof and subceiling, span 130,000 sq ft of plant area. Headroom gives access to entire systems



EMULSION MIXING TANKS, left, and 5000 lb capacity kettles, right, are laced together with process piping and controls. Stainless steel vats, center, store dextrins

HUMIDITY CONTROL is as vital as temperature control in the paper testing lab. With temperatures fixed at 70 F, these condensers hold the humidity at 50 percent

TYPICAL CLASSROOM receives odor-and dust-free ventilating air from supply duct diffusers, upper left. Classroom air is exhausted through locker vents to duct and to corridor. *Photos courtesy Barnebey-Cheney Co.*

Ventilation System in New School Cuts Heating, Installation Costs

By Homer Bird
Consulting Engineer

• Activated carbon filters are solving the odor problem in this Minnesota school, and at the same time are effecting savings, by reducing the volume of outdoor air necessary for odor removal and by keeping the boiler size to a minimum.

THE ASSUMPTION PARISH SCHOOL in the Minneapolis suburb of Richfield is a typical example of what savings can be achieved through the application of an activated carbon air recovery system. A saving of about 20 percent of the initial construction budget and about 33 percent of the annual operating costs of the heating-ventilating systems has been realized. That represents a saving of $12,000 on the original construction budget for a full-volume air replacement system, and $1650 per year on heating the church and school.

Savings made in Assumption's heating equipment and operation costs are, in the most part, concerned with the ventilating system. However, the type of heating system and its simplicity of control lends itself well to operating economy.

Heat is generated in a Scotch marine, low-pressure boiler fired by a rotary cup burner, using either natural gas or oil. The fuel change is easily accomplished by simple switching.

An induced draft fan assures constant high fuel-burning efficiency at relatively low cost, while permitting the use of a small, low chimney. This low chimney and a small boiler room also achieved a saving in construction cost.

Heat generated in the boiler is stored in the boiler water at tempera-

The author is president of the Minnesota Association of Consulting Engineers. He has employed the ventilating technique described in this article in several other heating and ventilating and air conditioning systems for public, commercial, and institutional buildings. This article is a condensation of an analysis by Homer Bird of an air recovery system installation.

. . . estimated saving on over-all installation is $72,000

tures ranging from 225 F at −20 F weather, to about 96 F when the outdoor temperature is 65 F and above. Hot water is circulated by a pump through the system mains at medium velocities at all times during the heating season. Thus, heat is always available to fill any zone thermostat demand.

The heat is delivered to the heated rooms mostly by gravity convectors, but in some cases forced flow convectors are used.

Temperature control in the several occupied zones is simple. A pneumatic positive-acting zone thermostat opens a zone valve for hot water when needed and closes it again when temperature demands are satisfied.

School Ventilation a Problem

School ventilation presents a difficult problem. The odor level in a school often becomes objectionable as a result of high occupancy during all kinds of heating season weather. The need for the full volume of outdoor air which is odor-free remains throughout the school day. While the odor level varies with the occupants' activity and is aggravated by overheating, any compromise in reducing the air volume to carry off the odors results in less satisfactory performance.

Therefore, the solution adopted for this school had to permit adequate circulation of ventilating air, while at the same time permitting the boiler plant to be sized in accordance with the load requirements so as to keep installation and operating costs as low as possible.

Saving Estimated at $72,000

The ventilation air rate generally advocated for acceptable ventilation in classrooms in average communities is one air change every six minutes, or at least 25 cfm of outdoor air for each occupant.

To heat this incoming volume of outdoor air from winter temperatures to an acceptable 70 F would have required an additional 24 hp of heat generating and distribution capacity. Such additional capacity would have raised the initial heating system cost by 20 percent from $60,000 to $72,000, or a difference of $12,000. Also, it would have increased the annual operating costs by an estimated $1650, an increase of over 33 percent.

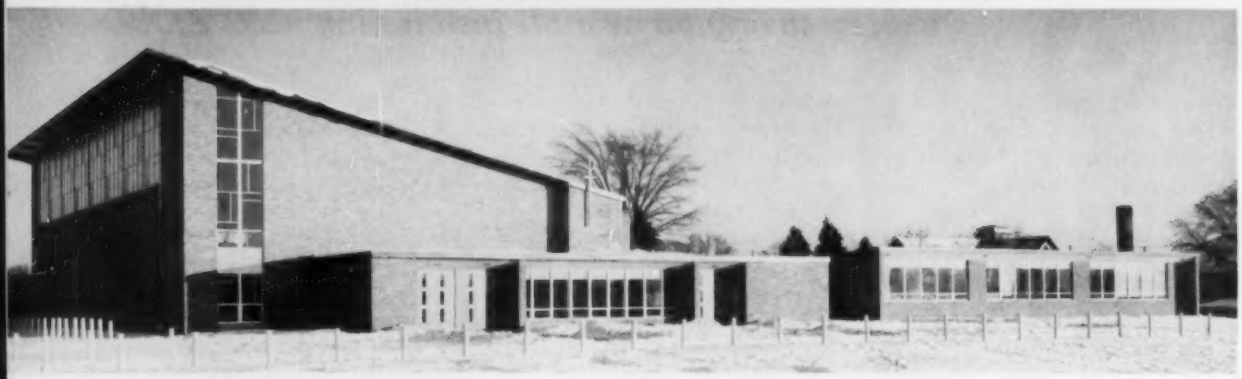
These two items of cost become especially impressive when considered on the basis of overall building lifetime cost, including initial cost, interest burden, replacement funding, electric power, fuel, and operating care. The indicated saving on the lifetime over-all cost of this installation, using a useful life expectancy of 30 years, totals $72,000.

Ventilating System Independent

One common method that is applied in avoiding the cost of such ad-

IN SCHOOL CORRIDOR, small outlets exhaust air from classrooms. Through large intake grille air is removed from corridor to filtering chambers, and through blower, to main air supply duct above corridor

CHURCH AND SCHOOL of Assumption parish, Richfield, Minn., are heated by a low-pressure hot water boiler. Heating system installation cost was cut 20 percent by new techniques, including activated carbon filters



. . . ventilating system operates independently of heating system

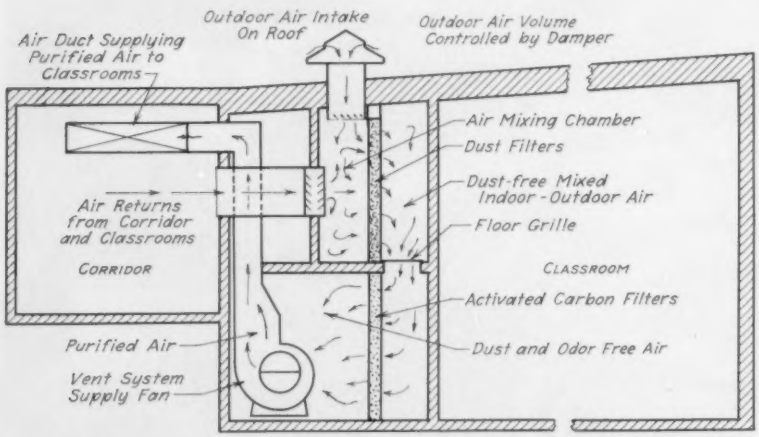
ditional heating capacity is a design wherein the outdoor air volume is proportionately reduced as the weather becomes more severe. Ventilation is ultimately eliminated at extremely low outdoor temperatures.

The control cycle in this case is such that the volume of heated outdoor air for ventilation is increased as overheating occurs. In other words, the greater the overheating condition, the greater the volume of heated outdoor air introduced, regardless of whether the overheating is the result of excessive heat delivery by the heating system, heat gain due to heavy occupancy, or heat gain due to sun exposure.

For instance, on a clear, still, sunny afternoon, a classroom with a west exposure and no occupancy will get more outdoor air for odor removal than is needed, while a similar room on the east, with a heavy occupancy and maximum need for odor removal, gets less ventilation than is required.

To avoid this condition, a ventilating system was installed in this school which operates entirely independently of the heating system. The full volume of filtered and odor-free air is supplied for ventilation to all the areas at all times. But there is no heat added to the supply air, so no additional load is imposed on the heating system. This also allows maximum cooling in warm weather, holding room air temperatures down in keeping with the temperature of the outdoor air that is available. Also, relative humidity is held down to an acceptable level by introducing small quantities of outdoor air under automatic control.

The accumulated odors are removed from the air already heated and within the building; then the purified air is recirculated. This is accomplished by recovering all the air from the building, using the corridors as main return air ducts emptying into a central plenum chamber. In the chamber, the returning air mixes with the small amount of outdoor air, and is then drawn through two sets of filters to the ventilation system blower, which moves the filtered air back through the duct system to the classrooms.



VENTILATING SYSTEM, employing both dust filters and activated carbon filters, delivers clean, purified, odor-free air, from 2½ cfm to 25 cfm per person, depending on outdoor temperature

Use Two Sets of Filters

The first filters through which the air passes are conventional dust filters of the renewable media type.

But the key to the system's economy lies in the second set of filters.

After having been cleaned of dust by the first filters, the air is passed through filters which contain granular activated carbon. This material filters and adsorbs objectionable odors and gases. The air which passes through these filters is consequently as odor-free as outdoor air.

No heat is added to the supply air, thus the boiler size and fuel consumption are kept to a minimum. Since removal of odors is accomplished by the activated carbon filters instead of air exchange, outdoor air — which is usually drier — is introduced during the heating season for the sole purpose of reducing the relative humidity at times when the heavy occupancy load would cause discomfort.

Performance Is Satisfactory

The amount of outdoor air thus brought in is small; it corresponds to the amount which can usually be heated by the heat liberated from the occupants. This is about 2½ cfm per person at design temperatures of −20 F and ranges up to 25 cfm per person at an outdoor temperature of about 60 F, when a maximum volume of outdoor air is introduced for cooling.

This system, in use for a full school year, has performed up to every expectation. The cost for regenerating the activated carbon filters in this school averages about $160 per year. To obtain a constant volume of supply air, the dust filters are renewed on a sequence rotation. Only one-fifth of the cells are renewed at one time, at periods shown by a direct-reading resistance gage.

The air recovery ventilating process was applied, in this case, to a central fan system of air handling. It is also possible to adapt the air recovery process for either heating or cooling unit systems. ⧺

Recognizing Danger Signs Can Prevent Many Boiler Accidents

. . . if corrective measures are taken in time

MANY serious boiler accidents can be prevented if danger signals are recognized and if corrective measures are taken before conditions become acute, according to The Hartford Steam Boiler Inspection and Insurance Co.

There are a number of signs that may be easily observed of abnormal conditions with oil-fired boilers which may cause explosions. One is a smoky flame caused by incomplete combustion. Usually this is the result of insufficient air supplied to the burner. Unburned gases may collect in the gas passages, and because of leakage or a change in draft conditions, enough additional air may be mixed with these gases to form a combustible mixture causing an explosion.

Another sign is a fire that continues to burn or splatter a flame after the burner has been shut down. This indicates that fuel oil is leaking into the furnace during idle periods, probably due to a control valve not being closed tightly in the oil line to the burner. The residual heat in the brickwork of the furnace may then vaporize some of the oil to form a combustible mixture of gases, which could be "touched off" when the burner is ignited.

A flame causing a cracking noise or having slight pulsations may be due to water or sludge in the oil line leading to the burner. A slug of water or sludge can extinguish the flame, and if the burner does not have continuous ignition, the furnace may be filled with a combustible oil vapor, which may subsequently be ignited.

When an automatically fired burner is slow to ignite or has a pulsating flame when starting up, this is most likely due to a defect in the ignition system. Such a condition will continue to get worse until the burner comes on, but the ignition fails completely. The result will be a mixture of fuel gases which can explode violently.

To prevent oil from accumulating, automatically fired oil boilers should be provided with an ignition or flame failure control designed to shut off the burner if the fuel does not ignite or if the flame fails. With this, a pre-determined amount of time will elapse before the control returns to its operating position. In this way, any fuel vapors in the furnace and gas passages are carried off by natural draft before ignition resumes. Since the control only operates to shut the burner down when an abnormal condition occurs, it also serves as a warning signal.

It must not be depended upon after any abnormal firing condition is observed. After such a time, the firing controls should be inspected and serviced.

A recent loss at a manufacturing plant is an example of what may result if danger is not recognized.

A small boiler, automatically fired with oil, was installed in a three wall cinder block building adjoining the production building. The boiler room roof was made of reinforced concrete 6 in. thick. The boiler had been in service less than a year when it was found necessary to replace an electrical lead connecting an ignition electrode to the ignition transformer.

After this necessary work was completed, the unit was returned to service. However, it was soon noticed that every time the burner started up there was a "puff back" or slight explosion. Unfortunately, no one appreciated the significance of this. After three days of experiencing poor start-ups, a furnace explosion resulted which ripped off the boiler jacket, collapsed the cinder-block walls and brought the heavy concrete roof down on the boiler.

An investigation of the accident revealed that one of the burner electrodes was loose, and this caused a poor spark. This could have caused the minor puffs which, in turn, may have dislodged the electrode to a position where no ignition was possible. The next time the burner came on, fuel oil entered the firebox without burning. Then the accumulated oil vapors were probably ignited by the hot firebox refractory. ⧺

25 Miles of Ductwork

To be dedicated this month, is completely air conditioned. Here ingenuity required for installation ventilating, and exhaust ductwork

INSTALLATION OF a ventilation system for a large commercial building presents a multitude of problems which frequently tax the resourcefulness of engineers and contractors. Such a building recently completed is the 41 story Mid-America home office building of the Prudential Insurance Co. of America in Chicago.

System Calls for 900 Tons of Galvanized Steel

The first eight floors of the building are occupied by the offices of the Prudential Insurance Co. The remainder of the completely air conditioned building is being rented. The initial ductwork for the first eight floors, plus that required to complete the fan rooms on the remaining 33 floors with the supply and return ducts terminating at the elevator corridor required approximately 1,200,000 lb of galvanized steel. To complete the duct systems being finished on the upper 33 floors another 600,000 lb will be needed.

In addition to the approximate 1,800,000 lb of galvanized steel for supply and return duct systems, 65,000 lb of black iron was used for the exhaust systems from kitchens in the building.

Most of the fan rooms are located to serve the floor upon which they are located as well as the floor above and below. This arrangement provides the best air and duct distribution plan with minimum space for the equipment. One fan room at the top of the building serves seven floors.

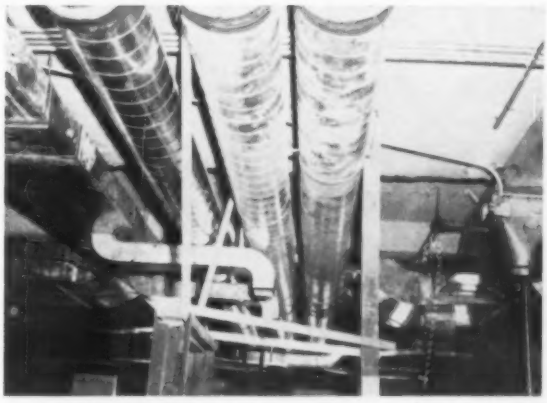
Fabrication of the ductwork was done in the shops of each of the sheet metal contractors and trucked to the building site. To reduce the necessity for on-the-job fabrication of fittings, over 150 shop drawings were prepared.

HIGH PRESSURE ducts wind around structural beams and over low velocity distribution ducts

ELBOW SECTION is fastened to a fan housing. Each elbow on the larger ducts has turning vanes

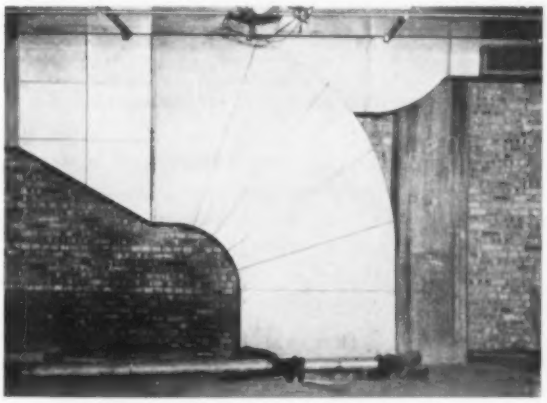
Serve New Prudential Building

Chicago's newest skyscraper are a few examples of the of 41 stories of air conditioning, which serve the huge structure.



MAZE OF DUCTWORK is made up of high and low velocity ducts and return intakes (right)

The quantity of ductwork required to serve this modern building practically fills the ceiling at the fan room discharge points. In fact, had high velocity, high pressure supply ducts not been used, the ceiling areas would have been inadequate at times. The heavy duty duct system is of 20 gage zinc coated steel conduit with a spiral lock seam. Velocities handled in this system range between 3000 and 4500 fpm, depending upon the size of the conduit and its purpose; branch ducts of course operate at lower velocities and pressures than the main supply ducts.



HORIZONTAL DUCT against ceiling turns to parallel wall before entering floor below

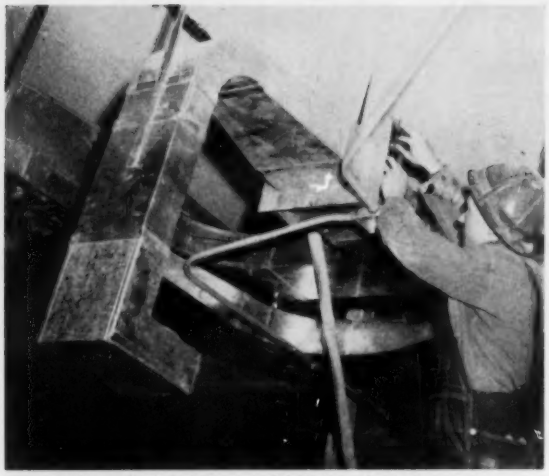
Sturdy Connections Minimize Leakage

Round conduit for the high velocity system was supplied in 12 ft lengths and trimmed to the dimensions required for the run. Its diameter varied with the air

CEILING OF DUCTWORK for supply, return and exhaust systems will be concealed

GOOD ENGINEERING shows up in placement of noise reducing sleeves close to blower discharge

. . . ingenuity builds skyscraper ventilation system



DUCT HEATERS are added for physical examination rooms of the dispensary to provide higher temperatures than required in surrounding rooms

volume required, ranging from 3 through 20 in. Where main supply conduit connections were called for, welded joints were used to cut air leakage losses to minimum. The specifications allowed no more than 10 cfm air leakage at a static pressure of 8 in. WG per conduit riser.

Branch conduit connections were mechanically fastened with drive or twist screws, then taped and covered with a synthetic rubber sealing compound.

Adequate Air Motion Maintained

The distribution pattern for the high velocity conduit system called for running main supply ducts to the building's perimeter where branch conduits take off at each window. The branch duct delivers filtered conditioned air to an auxiliary unit which tempers the incoming air with the room air. This auxiliary unit is capable of supplying or removing heat as required. No mechanical equipment is needed to mix induced air with room air as the discharge velocity of the supply air is sufficient to maintain adequate air motion within each area.

The specifications called for 1 in. glass fiber sound absorbing insulation inside each high velocity, high pressure main conduit for a distance of not less than 24 lineal ft after each fan or reheater coil.

All interior rooms are conditioned by air supplied from the low velocity, low pressure duct system, where velocities are below 1200 fpm. However, the specifications required that all rectangular ducts use 1 in. glass fiber sound absorbing insulation for a distance of 30 lineal ft or 4 ft past the first ceiling supply outlet or branch duct.

Specifications Show Magnitude of Job

The quantity of air handled through both the high and low velocity systems is 836,559 cfm. The estimated length of ductwork is 25.5 miles. There are 3750 ceiling diffusers and 2621 auxiliary units at the windows. Eighty-six centrifugal blowers are used, 76 for the low velocity supply and exhaust systems, and 10 for the high velocity systems. A point relative to the horsepower requirements of low pressure systems vs high pressure systems is interesting to note — 845 hp is needed for 76 low pressure blowers while the requirement is 675 hp for 10 high pressure blowers.

Fabrication of the ductwork followed specifications designed to give maximum air delivery at the lowest pressure loss and greatest rigidity to the wide sections of the duct. All turns were limited to a radius not less than twice the width of the duct up to 12 in. wide and not less than the width of the duct for sizes wider than 12 in. Turning vanes were required for all large ducts. The full area had to be maintained whenever it was necessary to change the duct shape to coincide with building structural features.

Angle Iron Braces Reinforce Ducts

Reinforcement of ducts between 24 and 40 in. wide was accomplished with $1 \times 1 \times \frac{1}{8}$ in. angle iron on 4 ft centers. For ducts between 41 and 60 in. wide, angle iron bracing of $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{8}$ in. on 4 ft centers was used. Ducts over 61 in. wide used $2 \times 2 \times 3/16$ in. angle iron bracing on 4 ft centers. The angle iron bracing was fastened to the duct with rivets on 9 in. centers. An exception to the 4 ft spacing for the braces was made where beams forced a change in the brace location, the limit permitted being a maximum of 2 ft beyond the original spacing required.

All branch ducts in the low pressure system have their own volume control dampers which are adjusted by a manually operated quadrant or worm drive regulator where the ceiling covers the branch takeoff.

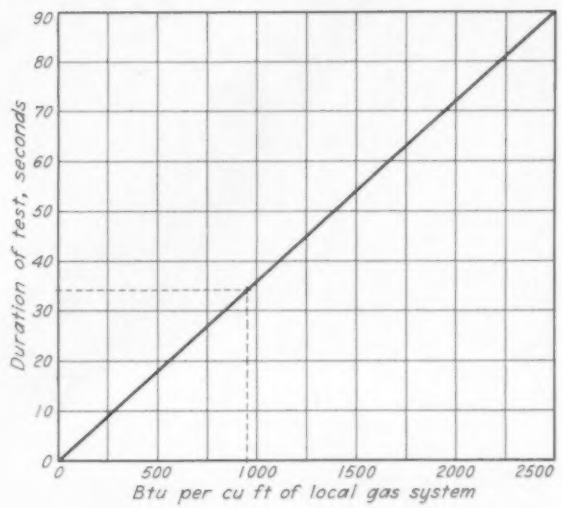
To complete the air distribution system, cleanable filters are used in banks to permit a constant air volume supply to the fan at a low resistance to air flow. Air flow resistance gages are installed for periodic inspection without the serviceman having to enter the filter compartment.

Architects and engineers were Naess & Murphy. Ventilating contractors were R.B. Hayward Co., Jamar-Olmen Co. ‡

Eliminate Boiler Room Arithmetic

. . . by simply reading boiler input from the gas meter

• Boiler input in hundred thousand Btu per hr can be read directly from the gas meter being equivalent to cubic feet of gas passing through the meter in a given time. For example, a meter reading of 9.3 cu ft in 34.2 seconds means an input of 930,000 Btu per hr. Text explains how time unit, dependent on the calorific value for the local gas in Btu per cu ft, is worked out. Dotted line shows conditions in Detroit.



By George H. Amber

Professional Engineer, Amber Brothers, Inc.

FOR YEARS our firm has been figuring the Btu input to gas burners the hard way. We just didn't know any better.

Does this routine sound familiar?

1) Measure the cubic feet consumed for one minute, at the gas meter.

2) Multiply the reading by 60 to get cubic feet per hour.

3) Multiply the reading again by the local calorific value of the gas in Btu per cubic foot.

While there's nothing wrong with this time tested method, it seemed to bog down at times, resulting in needless error and delay. Naturally, the slide rule boys scoff at such an easy problem. But our installers fouled it up at times. After all, their tool is a wrench, not a pencil. And numbers don't always jive after a long day's work in a hot boiler room.

If the problem had to be done only once, it wouldn't be so bad. But in most cases the firing rate is sized to a boiler, which means up to six set-and-try operations. So there is no time for petty ciphering. Also something to consider is the hourly pay angle while the installers are intently doing their arithmetic. And if the time gets late, the last pinpoint setting may be skipped entirely. That is, until the inspector's "invitation" to cut down the overfiring arrives.

At last, and somewhat unexpectedly, our firm's "theorist" came up with a method for determining Btu input that doesn't require any calculations at all. The installers simply measure the number of cubic feet that go through the gas meter in 34.2 seconds. This direct reading is equivalent to the Btu input in hundreds of thousands of Btu. For example, 7.75 cu ft in 34.2 seconds means an input of 775,000 Btu per hr.

Here's how it was worked out. The universal formula for Btu per hr input is:

$$\text{Btu per hr} = VK(3600)/t$$

where V = volume of gas during test, at gas meter; K = Btu per cu ft for the local gas; t = duration of test, in seconds.

Thus, when $t = K(3600)$, then V = Btu per hr. The volume in cubic feet would have the same value as the Btu per hr. But $K(3600)$ seconds is over six weeks! Therefore, the following value of t is used:

$$t = K(3600)/100{,}000$$

Under this condition, the reading at the gas meter represents hundred thousands of Btu per hr. To find the exact number of seconds for direct reading of hundred thousands of Btu per hr in your locality, substitute the number of Btu per cu ft of the gas you use for K. Or, refer to Fig. 1, which covers most of the commercial gases.

For example, in Detroit, where $K = 950$:

$$\begin{aligned} t &= K(3600)/100{,}000 \\ &= (950)(3600)/100{,}000 \\ &= 34.2 \text{ seconds} \end{aligned}$$

Thus, in Detroit or in any other locality using 950 Btu per cu ft gas, the meter reading in 34.2 seconds equals hundred thousands of Btu per hr input. No pencil work.

Installers seem to approve of this simple method, as they are spared the embarrassment of having to own up to a wrong gas input setting. To help them remember just what value t equals, a red dot was painted on their watch crystals at 34.2 seconds. ‡

. . . extremely dry air is necessary for handling hygroscopic ingredients of the solid fuel propellant for jet assisted take offs

Fuel Production for JATO Planes Depends on Air Conditioning

• In the design of the two-stage, liquid adsorbent dehumidifying system — used with an air conditioning system — 23 year weather averages were studied. Data indicated not only the required capacities for various parts of the system, but also the most economical method of operation.

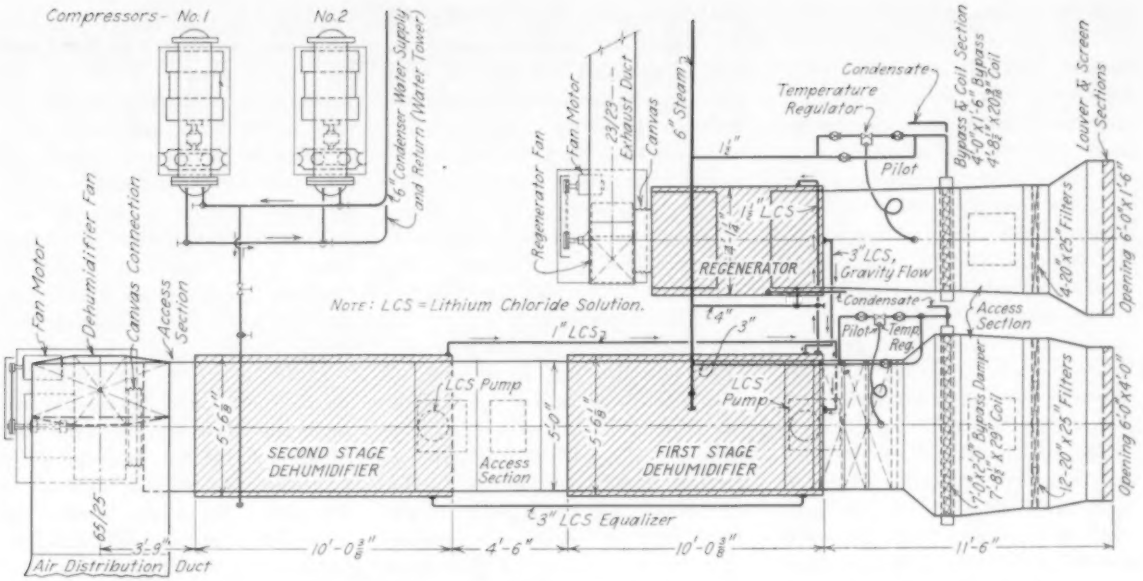
By David C. Pfeiffer

David C. Pfeiffer & Associates, Consulting Engineers

ATMOSPHERIC CONTROL is essential in the production of the fuel and other equipment for jet assisted aircraft take offs. Among the ingredients required for the solid fuel propellant are those of hygroscopic nature, requiring extremely dry air. Therefore, conditions within the buildings are designed to maintain 90 F dry bulb temperature, 58 F wet bulb temperature, and 26 F dew point temperature. At these conditions, air has a moisture content of 20 grains per lb and a relative humidity of 10 percent.

A study of climate in the area of this plant indicated that for maximum outside conditions a temperature of 100 F and a moisture content of 130 grains per lb should be used. These conditions are not simultaneous, as temperatures of 110 F DB were experienced during the summer of 1954. A moisture content of 145 grains per lb was experienced but not when the temperature was 110 F. As the inside conditions were to be designed for 90 F, no difficulty was experienced from the 110 F days. For winter, the outside DB temperature was assumed to be 10 F. The actual location of this plant is withheld for security reasons.

For proper balance between moisture load, sensible heat load, and air movement, the system was de-



TWO-STAGE DEHUMIDIFIER SYSTEM operates most economically when first stage unit removes as much moisture as possible, using cooling tower water as the cooling medium for maintaining the temperature of the lithium chloride solution and the second stage unit, with its refrigeration system, removes the balance

signed on the basis of a 10 grain per lb moisture pickup for entering air. Reheat control is used for maintaining the desired dry bulk temperatures in the areas. If a moisture content of 20 grains per lb were to be maintained in the conditioned areas, and a moisture pickup of 10 grains per lb were to be used, then the air must enter the areas with a moisture content of 10 grains per lb.

Remove Moisture in Two Stages

The system consists of a lithium chloride solution in water in such concentrations as necessary to prevent a saturated solution at the temperature required. As the lithium chloride picks up or adsorbs water vapor from the air, the concentration is reduced, and the weak solution of lithium chloride and water is pumped to a steam heated regenerator where the water is boiled off, and the solution is returned for adsorption of additional water vapor.

With this system, the moisture content of the air can be reduced from 130 grains to 45 grains per lb by using cooling tower water to cool the lithium chloride solution. The temperature of the solution must be controlled since the capacity of the adsorbent to adsorb water vapor is inversely proportional to its temperature.

This is also true if the effectiveness of the adsorbent is to be maintained, since the condensation of water vapor from the air is accompanied by the release of about 1060 Btu per lb. With a 78 F WB temperature, it is economical to obtain 84 F cooling water from a cooling tower. With 84 F water available for the cooling coils of the first stage unit, the moisture content of the air can be reduced from 130 grains per lb to 45 grains per lb. This leaves 35 grains per lb to be removed by the second stage unit.

In order to obtain a moisture content of the leaving air of 10 grains per lb, it was decided to use direct expansion coils in the second stage unit, with a coil temperature of 20 F. It would be possible to use a lower temperature and a smaller unit or a higher temperature and a larger unit, but an economical balance between refrigerating capacity and adsorption capacity indicated that the 20 F evaporator temperature would be the most economical.

A typical dehumidifier installation for maintaining constant humidity control is shown above. This does not show the reheat equipment, which consists of a multi-zone air conditioning unit having individual face and bypass damper controls for each zone which are thermostatically operated from each zone.

This equipment uses 100 percent outdoor air, since recirculation of air for this application was not economical. Outdoor air entering the first stage dehumidifier passes first through weatherproof louvers, then through a filter section, and through a preheat coil section — used when outside temperature is below 40 F.

The preheat coil section has a manual bypass damper, which permits the air to bypass the coil when desired. Air then enters the first stage dehumidifier, where it is brought into contact with the lithium chloride solution through a spray system.

To reduce the moisture content from 130 grains per lb to 45 grains per lb in the first stage, it is necessary to keep the lithium chloride solution at a temperature below 95 F. Cooling tower water is used to do this, circulating it through a heat exchanger. Water leaves the cooling tower at 84 F DB.

The two dehumidifiers are used in series. One fan draws air through

both units. The first stage dehumidifier extracts as much moisture as possible from the air by allowing the cooling tower water to circulate at whatever temperature can be obtained from the cooling tower during the year. While temperatures are not below freezing much of the time, protection had to be provided to prevent freezing. The 23 year average weather records show a minimum average temperature of 38 F for the months of December and January. However, there is usually a period of one to three weeks in winter when temperatures are as low as 10 F.

The cooling towers are equipped with two speed fans with thermostatic control. When the outside temperature reaches 40 F, the fan speed is reduced to half speed, and when the outside temperature reaches 32 F, the fan is shut off. For operation below 32 F, the cooling towers may be bypassed manually.

In the second stage dehumidifier, the temperature of the lithium chloride is controlled by means of a direct expansion refrigeration system for the cooling coils. The two compressors are shown at the left on Page 85. Each compressor is separately connected to a section of coil, so that there are four steps of capacity control in each unit.

The only time that the capacity of the first stage dehumidifier needs to be reduced would be at a time when the dehumidifying load on the second stage unit would be so small that the refrigerating units would not be operating continuously at reduced capacity. The reduction of load on the first stage unit could then be accomplished by either throttling the water flow to the coils, shutting off the fans of the cooling tower, or bypassing the tower.

The humidity control in the area is obtained by controlling the dew point temperature of the air leaving the second stage unit. As the air leaves the second stage unit at approximately the same temperature as the solution, the temperature of the lithium chloride solution is used for sensing this temperature rather than the air temperature itself.

As the lithium chloride solution picks up moisture from the air passing through the units, its vapor pressure is increased and the salt concentration is decreased. In order to maintain the vapor pressure of the lithium chloride at a low level so as to extract the water vapor from the air, it is necessary to continuously "boil out" the water picked up from the air by heating approximately 100 percent of the circulated solution by a steam coil regenerator.

This regenerator consists of a separate fan, drawing air through a unit with a steam coil for boiling the lithium chloride solution. Air is drawn in through the weatherproof louvers, filters, and preheat coil to the regenerator, where the warm solution from the steam coil is sprayed into the air stream. In this way, the moisture in the air is evaporated until the desired concentration is obtained. Then the solution is pumped back to the first and second stage units through a piping system shown, in part, on page 85.

The operation of the steam preheat coil for the regenerator is somewhat different from that for the first stage dehumidifier. It is desirable to have the incoming air for the regenerator as warm as possible at all times. Therefore, the preheat coil is set at 70 F. The preheat coil for the first stage dehumidifier is set at 40 F, since any additional heat added to the air will represent an additional load to the cooling tower system, or the refrigerating system, or both. The fan for the regenerator discharges the hot saturated air outside. The fan drawing air through the two dehumidifiers discharges the cold dry air at a temperature of about 37 F to the reheat unit. The air is then heated to maintain a temperature of about 90 F in the working areas.

How Control System Operates

The pneumatic control system functions as follows:

1) A remote bulb thermostat operates a pneumatic motor which controls the opening of a face and bypass damper in a multi-zone reheat unit. This reheat unit consists of a coil and a fan with dampers, so that when the face damper is closed and the bypass damper is opened, all the air will be diverted around the coil. In the other extreme position — when the face damper is open and the bypass damper is closed — all the air will be forced through the coil. To prevent temperature overriding when the face damper is closed, an auxiliary contact closes a valve in the hot water line supplying this unit.

2) To control the hot water leaving the convertor for the reheat coils, an outside controller resets the temperature of the hot water inversely with the outside temperatures, so that during the coldest weather the water will be the warmest. This control has a minimum water temperature setting, so that during the spring, summer, and fall, water will be controlled at a constant temperature to the reheat unit. During extreme winter weather the hot water temperature will be increased, to partly compensate for the additional conduction load.

3) The primary function of the control for maintaining not less than 40 F air from the preheat coil to the first stage dehumidifier is to prevent icing of the first stage unit in cold weather.

4) The temperature of the air leaving the preheat coil and entering the regenerator is kept as high as possible. Therefore, this controller will have more service during the winter than the one controlling air to the first stage dehumidifier.

5) A constant dew point temperature of the air is maintained directly by controlling the temperature of the lithium chloride solution in the second stage dehumidifier. Four pneumatic electric switches control the flow of liquid refrigerant to each of the four coils in the second stage dehumidifier. A constant suction pressure controller maintains a constant evaporator pressure in the coils by reducing the capacity of the compressor to match the capacity of the coils in operation. This is desirable, to prevent reaching a saturated condition of the lithium chloride solution, which might occur if no effort

TABLE 1—WEATHER AVERAGES for 23 years shown here were used to determine operating cost of two stage liquid adsorbent dehumidifying and air conditioning system. By not recirculating any air from the areas where 90 F temperature is maintained, a total saving in sensible and latent heat of 41,370 Btu per 100 cfm is realized

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Daily temperatures, F						First stage dehumidifier	
Month	Maximum	Minimum	Average	Relative humidity, percent	Wet bulb temperature, F	Grains per lb of air	Cooling tower Water, F	Outlet air, grains per lb	Leaving Air, F
January	55	38	46.5	61	41	30	47	11	51
February	59	40	49.5	58	43	30	49	11	51
March	67	47	57	51	49	37	54	12	53
April	75	55	65	51	54	47	60	16	63
May	81	63	72	56	61.5	64	67.5	22	70
June	90	71	80.5	51	67	80	73	26	72
July	94	75	84.5	48	69	84	75	28.5	80
August	94	75	84.5	46	68	82	74	28	74
September	87	68	77.5	51	65	72	71	25	72
October	78	57	67.5	52	56.5	52	62.5	18	63
November	66	47	56.5	53	48	36	54	13	55
December	56	38	47	58	41	28	47	10.5	50
Annual Averages	75.2	56.1	65.6	53	55.3	53.5	61.3	18.4	62.8

was made to balance compressor capacity against coil capacity.

6) A system of controls inherent with the equipment includes two float controls, for emergency use only, to assure a minimum operating level of solution in the tank. They are electrically interlocked to prevent operation of the main fan unless sufficient solution is in each dehumidifier.

A small three-way control valve supplies condensate to the solution to replace some of the water which could be evaporated from the solution in the regenerator. It is necessary to check the concentration of the solution periodically, as excessive make-up from this condensate valve could weaken the solution, and excessive regeneration could cause the solution to become too strong.

Entirely automatic, the system is controlled from one push button station on the supply fan. Electrical interlocks provide shutdown of the system if any essential motor fails or if the solution level becomes dangerously low.

In the areas conditioned, an exhaust system exhausts 90 percent of the air supplied by the main fan. It is sized to maintain a slight pressure in the area, so that any opening of doors will cause an outward flow of air, thus minimizing the infiltration of water vapor.

For the system to operate properly when the supply fan is started, it is necessary for both the first and second stage lithium chloride washer pumps to be in operation, the exhaust fan in the area to be operating, and the regenerator fan energized, so that it can operate if required. If the solution level in the dehumidifiers is below the minimum required by the electrode in the electrical circuit, the entire system will shut down. The normal operation is, therefore, to start the supply fan, which will instantly start the other motors. The supply fan cannot start fully until all of the motors are operating. Also, if any of the other motors fail, the supply fan will automatically stop.

Studied Weather Records

To determine the cost of operation, a 23 year average weather condition has been used as a base for the typical year shown in Table 1. Third column is the mean average temperature for the month. Columns 1, 2, 3 and 4 are taken from the weather bureau records. The seventh column is the expected temperature from the cooling tower, based upon a 6 F approach to the wet bulb temperature. This approach is constant throughout the year because the heat load is decreased in the wintertime, when the wet bulb temperatures are lower.

Column 8 shows the grains of moisture per lb expected from the first stage unit based upon the conditions of columns 6 and 7. Column 9 shows the expected air temperature leaving the first stage dehumidifier based upon the data in columns 6 and 7. The data for columns 8 and 9 were obtained from the manufacturer of the cooling tower.

When operating on 100 percent outdoor air, the second stage dehumidifier receives air at the temperature given in column 9 and with a moisture content shown in column 8. If the second stage were operating on 100 percent recirculated air, the return air to this unit would have an average temperature of 90 F and a moisture content of 20 grains a lb.

Save By Not Recirculating Air

The average temperature of the air from column 9 is 62.8 F and the average moisture content from column 8 is 18.4 grains per lb. The saving in sensible heat per 1000 cfm would then be 29,160 Btu. The latent heat saved by the lower moisture content of the entering air will be 12,240 Btu. The total Btu saved will then be 41,370, or approximately 3.4 tons of refrigeration capacity per 1000 cfm.

Thus, in any typical year, there will be a saving in the cost of operation by not recirculating air from the areas where the temperature is maintained at 90 F. While during the summertime, more capacity must be installed for operating with 100 percent outdoor air, this cost will be offset by the savings resulting from the omission of the return duct, and other elements. This will also result in a safe operation.

Calculate System Requirements

Air capacity required for the dehumidifier units serving the 37,380 cu ft of conditioned area is 9000 cfm, or one air change every 4 minutes. Assuming a moisture pickup of 10 grains per lb, 643 lb of air

are required per minute. This is adequate for the estimated product load at 100 percent — including 2116 Btu per hr, moisture infiltration; 21,120 Btu per hr, traffic doors; and 6000 Btu per hr, people — and recovery from washdown, or a total of 58,472 Btu per hr.

The amount of cooling tower required for the first stage unit is 375 gpm, for the removal of 562,350 Btu per hr (latent) from the 489 lb of water removed from air per hr, and for the removal of 751,000 Btu per hr from the regenerator. This allows a 7 F temperature rise.

Refrigeration capacity required for the second stage unit is 78.7 tons for a total load of 945,000 Btu per hr. This includes: 231,840 Btu per hr (latent), in moisture reduced and removed; 612,360 Btu per hr, sensible cooling of the air; and 100,800 Btu per hr, heat from the regenerator. The unit has a face area of 21.9 sq ft and a capacity of 43,100 Btu per hr per sq ft of face area. The outlet air temperature is 37 F; the evaporator temperature is 22.5 F. Thus, requirements are 78.7 tons at 22.5 F evaporator temperature. However, 88 tons was specified at an evaporator temperature of 20 F, which would give more than 78.7 tons at an evaporator temperature of 22.5 F.

In winter, the diffusion temperature difference, based upon 9000 cfm as determined by moisture load calculations, is 10.5 F. This is for design conditions of 10 F outside and 90 F inside and for a total load of 101,700 Btu per hr, neglecting the internal load.

To maintain 90 F in the area, air must be supplied at 100.5 F. Air will normally leave the second stage dehumidifier at 36 F. It will be reheated to 100.5 F by the reheat units. This will require 626,900 Btu per hr. Therefore, approximately 627 lb of steam per hr are required for the steam convertor to heat this water in winter.

The estimated heat load from the two 150 hp motors, assuming a 50 percent diversity, is 549,000 Btu per hr, or several times the heat loss from the building. When these motors are operating, it will not be necessary to supply air into the building above 90 F. It will probably be necessary to supply air below 90 F to allow for some of this internal heat gain.

Since it is impossible to accurately predict the nature of this electric load, the only conclusion that can be drawn is that the maximum heating load which will be required by the unit will be that calculated for winter operation. This does not consider the internal load. Cooling will likely be necessary even in winter when the equipment is operating.

The steam requirement for the first stage dehumidifier is 290 lb per hr, or 291,600 Btu per hr. This preheat coil is based upon heating 9000 cfm of air from 10 F to 40 F. It is not necessary to heat this air above 40 F, since the refrigeration requirement for the unit would then be increased.

Steam required for the preheat coil for the regenerator is 180 lb per hr, or 181,400 Btu per hr. This is based on heating 2400 cfm from 10 F to 80 F.

The sensible cooling load in summer, for design conditions of 105 F outside and 90 F inside, is 630,080 Btu per hr. This includes: 15,900 Btu per conduction; 28,800 Btu per hr, sun effect; 2250 Btu per hr, people; 34,130 Btu per hr, lights; and 549,000 Btu per hr, motors, assuming 50 percent diversity.

The diffusion temperature difference based upon an internal sensible heat load of 630,000 Btu per hr and 9000 cfm is 64.8 F. The air flow rate of 9000 cfm was previously determined by moisture load calculations.

To maintain 90 F in the area, air supply must be 25.2 F. Air will normally leave the second stage dehumidifier at 36 F. No reheat will be required when both mixers are in operation; it may be necessary to operate the refrigeration units at lower temperatures to bring air into the building at about 25 F. ⧺

Stainless Steel Piping Installed for Acids

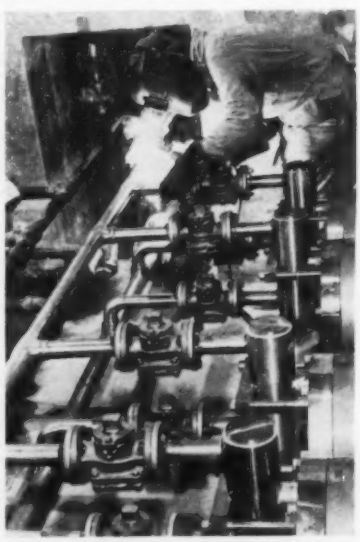
. . . protects against corrosion

STAINLESS steel piping is installed at the General Electric Co.'s Appliance Park, Louisville, Ky., plant to convey acids safely and economically, according to the Tube Turns Div. of National Cylinder Gas Co. The piping protects against severe corrosion in conveying large quantities of nitric, sulfuric, and phosphoric acids, used in cleaning and pickling metals and alloys that go into major appliances.

Fittings used for directional changes permit optimum flow conditions and permanently tight joints, and have various properties that contribute to the piping's service life.

The acids are stored at several tank farms conveniently near the buildings they serve. The acids are pumped to work areas through under and above ground piping. Capacities of the farms' tanks range from 10,000 to 12,000 gal, and those that hold nitric and phosphoric acids are lined with Type 316 stainless steel.

The consulting engineer was Eggly-Furlow, and the piping contractor was Kerby-Saunders, Inc. ⧺



NITRIC ACID HEADER of Type 316 stainless steel 1½ in. in diameter is fabricated with Schedule 10 welding fittings and 150 lb flanges to convey concentrated acid at 40 F Baume and room temperature. Design pressure is 100 psi; operating pressure, 60 to 68 psi

Sam Lewis' Page

Heating Plant 'Growed' Like Topsy

. . . with repeated expansions of a large hospital

THIRTY-FIVE years ago I designed for a wellknown hospital in Chicago the mechanical equipment. In those days, electric power was available, but almost always was of direct type. I tended strongly in those days to prefer steam power to electric power for pumps and engines, as in a hospital steam was always available at a pressure approaching 100 psi.

There were two manually fired water tube boilers, served by a reinforced concrete chimney. At that time I had not met with an unfortunate experience where a steel form for a concrete chimney slipped before the concrete could harden. The chimney has an ugly hump that couldn't be concealed or corrected. Since that episode, I have strongly favored radial brick chimneys.

About five years later, another addition to the hospital was constructed, and the two original boilers soon needed help. So we added Boiler No. 3. Although engineers at that time were learning to burn fuel oil, satisfactory burners were scarce in this territory. Therefore, we sought an efficient way to burn Illinois bituminous coal without chimney-top smoke.

A motor driven coal pulverizer was installed for Boiler No. 3 in this hospital. It ground the coal to a very fine powder, and this fuel — introduced by forced draft — burned in suspension. There was no smoke as long as the correct coal-air ratio was maintained.

A few years later, another addition to the hospital was required, and the necessary increase in steam supply was achived by installing oil burners in Boilers No. 1 and No. 2. This oil was preheated bunker C, and we wasted the condensate from the oil heaters, lest by some obscure leak, oil might get into the boilers, or water might get into the oil.

Then came another big addition to the hospital. This time, the boiler that burned pulverized coal needed repair of the refractory lining of the combustion chamber. The coal conveying equipment was worn out, and did not justify replacement to serve only one of the boilers with coal, while two of them burned oil. Therefore, Boiler No. 3 was changed to burn oil. And for several years we could forget the hospital.

However, another addition — about one-sixth of the total load — then became necessary. I was requested to approve the installation of new water walls in the narrow, old, oil burning water tube boilers, Nos. 1 and 2. Apparently, by adding water walls and going to about 180 percent of rating, we could make this addition.

I have a deep appreciation of the way water must circulate within a water tube boiler to pick up the heat from combustion. I have seen boilers that originally were superlative heat absorbers go chaotic after the entirely different and frequently unpredictable streams of water induced by water walls attempted to cool the hot surfaces.

I convinced the hospital that rather than take chances on rebuilding Boilers 1 and 2 it would be wiser to install a new water wall type boiler to replace old Boiler No. 3. Since this was done, we have all been delighted to observe the results from Boiler No. 3, with its modern combustion chamber and adequate water circulation. It has tubes all around the combustion space, and though apparently no larger in floor area than either No. 1 or No. 2, it easily took over the work of both of them. When the next addition raises its head, it appears probable that we can replace Boilers No. 1 and No. 2 with one new boiler in no larger space, while Boiler No. 3, at an acceptable overload, will keep things warm.

An efficient water treating plant and a deaerating feedwater heater would have been appreciated. We have supplemented the steam pumps with alternative electric pumps.

When the next addition to the enormous building is required, I predict that we shall be developing comfort cooling from these same boilers via an absorption type refrigerating plant, with a cooling tower on the roof for the condensing water.

The absorption principle, using a chemical refrigerant, less noxious than ammonia and at conservative pressures, has advanced to such an extent that the steam boilers that heat a building in winter will loaf along in summer to furnish steam at a pressure of less than 15 psi to cool the entire building.

We recently employed an absorption system for about 800 tons of refrigeration in comfort cooling. We made double use of low pressure exhaust steam from turbines that operate compression type refrigeration. The combination of the two types in converting heat from an initial supply of high pressure steam to refrigeration for cooling air shows a considerable increase in efficiency over either process alone. ⧺

Practical Piping Problems

Process Piping System Replaced

. . . with tin lined equipment for product quality

When a process piping system had to be replaced as a result of a fire, trouble began. The product, bright red cherries, turned black after a few weeks on the jobbers' shelves.

The cause, Mac finds, was the replacement of the original tin lined sugar tank and piping with copper equipment. Sulfurous acid bleached sugar, reacting with the copper, formed copper sulfate, which turned the cherries dark.

The only answer was to take out the copper and install a new tin lined system.

By Bill Dopp

MARTIN MACVANE stood in the doorway of the office of Joe Stoddard, president of the Purity Food Specialty Co. "You look as though you had lost your last friend," said Mac.

"Hello, Mac. Come on in," said Joe. "Find yourself a seat."

"Wonderful enthusiasm, I must say," observed Mac. "What goes?"

"Looks as though my last dollar goes," said Joe dejectedly.

"Well, unburden yourself. You'll feel better if you get it off your chest," said Mac.

"Mac, I don't know what to do. Don't even know what to think." Joe shook his head sadly. "You know our line of specialty packaging, spiced onions, red and green peppers, olives, and cherries. Well, things have been going along fine, with production getting bigger all the time, until recently." He paused thoughtfully. "But we have been getting back our fine maraschino cherries by the truckload. They go out of here a perfect brilliant red. They come back in a few weeks a dirty blue black. The bottles haven't even been opened."

Joe got up, pacing back and forth across the office. "We can't find out what does the dirty trick."

"Is that so serious?" asked Mac. "Probably something wrong with the way you put them up. That shouldn't be hard to find out."

"Nuts!" snapped Joe. "We haven't changed our way of preparing those cherries for years. Ever since prohibition, our cherries have been favorites with barkeepers all over the country. Now they won't touch them. Our market is gone. We're losing our sale of little onions and peppers, too." He stopped, abruptly thrusting his hands deep into his pockets. "Mac, it looks as though we're sunk."

"Gosh. When did this thing start?"

Joe sat down. "About six weeks ago we began to get the first of these black cherries back, along with a raft of howls from all our jobbers. We quit production three weeks ago, cleaned up everything and started over. The first of the new batch is beginning to show color change already." He shrugged wearily.

"You've checked everything carefully?" asked Mac.

"Checked and double checked." Joe pounded on the desk. "Nothing gets into those bottles that we don't intend should be there. That I'll swear to."

"Mind if I ask a few questions, Joe?" Mac leaned back easily. "There's an answer here somewhere."

"Go ahead," said Joe.

"Tell me about this cherry packaging. Where do you get the cherries, and what do you do to them?"

Cherries Sealed in Cans

"We get the cherries in sealed cans from sources in California," said Joe. "They are the big white cherries, some pitted and some with seeds and stems intact. For Manhattan cocktails, barkeepers prefer them with the stems on. They are blanched and

Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch as a sales engineer. He is devoting part of his present leisure to writing of his many piping experiences. All the names used are fictitious.

processed and shipped in light sugar syrup. We wash the fruit, inspect it, dye it, and package it in scientifically sanitary conditions."

"Your dye?" Mac asked.

"No, Mac," replied Joe. "Our dye is a pure vegetable product that is something of a trade secret. We have a darn good chemist, Wade Emerson, who controls that absolutely. Wade swears that nothing has changed in the dyeing process. It is something of a time and temperature procedure and must be carefully controlled to get the right color. He declares that something is getting into the process during the packaging, but he can't put his finger on what it is."

Glancing toward the door, Joe said, "Here comes Selmer Brown, our superintendent. Selmer swears that Wade is crazy."

"Selmer, this is Martin MacVane, an old friend of mine. He's trying to fathom our trouble just for the fun of it," Joe said.

Fire Wrecked Equipment

"Glad to know you," said Mac, as Selmer nodded to him. "Seems that you fellows are in distress."

"And how!" declared Selmer. "We've had nothing but trouble ever since our fire."

"Fire?" Mac looked from one to the other.

"Oh, sure," Selmer went on. "We had a peach of a fire about four months ago. It started from defective wiring and pretty generally wrecked the place. We had to rebuild a big percentage of our equipment before we could get going again."

"That must have been quite a loss," said Mac. "Did you replace the equipment with the same kind of material?"

Had to Repipe System

"The loss was mostly covered by insurance," declared Joe. "We lost a lot of production, though. Fortunately, we were able to salvage much of the cooking and packaging machinery, though we did have to repipe most of the works."

"It gave us a chance to rearrange some of the apparatus, too," said Selmer. "We cut out a couple of particularly aggravating bottlenecks."

"And the trouble with the cherries started after you made those changes?" Mac asked. "Did you change the arrangement of the cherry process?"

"Well, yes, we did," replied Joe, looking thoughtfully at Selmer. "We moved the dyeing equipment and rearranged the packaging of the cherries so that it would be out of the way of the other processes. We can't use that equipment for anything else. All of our other products are packaged in brines. The cherries are the only thing that we package in sugar syrup."

"So that's when the trouble started," declared Mac.

"No, no," argued Selmer. "It was weeks after we got the new arrangement working before we heard anything about this color change." His voice rose sharply. "We never changed a thing in the process, just the arrangement of the parts."

"I see," said Mac. "Something changed, but you didn't do it."

Joe held up his hands, stopping Selmer from making a violent retort. "What do you mean, Mac," he asked. "You've got some kind of an idea. What is it?"

"What Was Changed?"

"Fellows," Mac began, "when any process has been going on successfully for a long time and it suddenly begins to fail, it is always a sure indication that something has changed. Here we know that the arrangement of the parts has changed, but we also have to suspect that some unseen unintended change has taken place." He pointed a finger at Joe. "Go over that equipment with a fine toothed comb; find out what you did unwittingly to change your process. Maybe this is a job for your chemist."

Selmer growled and left the office.

"Don't mind him, Mac," said Joe. "He's as worried as the rest of us." He picked up the phone. "Wade, will you come in here a moment?" he said when he got an answer.

Wade came into the office.

"This is Martin MacVane, Wade. We're discussing cherries, about which you may have heard."

"You're darn right, I've heard. What do you know about cherries, Mr. MacVane?"

"Nothing," returned Mac. "I'm trying to find out something about them from Joe, here. It seems that there were certain changes made after the fire. Your friend Selmer declares that they did not affect the process. What do you think?"

"Well," said Wade thoughtfully, "I really can't see that what they did could introduce anything into the process to cause this trouble. The color of these cherries changes gradually from bright red to dull blue black. I've checked every step of the process, and I'm darned if I know where to turn next."

"You're sure the dye is the same?" Mac asked.

Dye Was Not Affected by Fire

"Yes, I'm sure of that. This is the same batch of dye that we were using before the fire. That was not affected in any way by the fire, since the store room was not touched. Didn't even get water soaked, like the office here." He grinned at Joe.

"After the cherries are dyed, what do you do to them?" asked Mac.

"We drain them thoroughly and put them into a sucrose syrup solution. Then they are brought up to temperature and packaged."

"Sucrose?" said Mac, "That's sugar, isn't it?"

"Yes. Cane or beet sugar," said Joe. "We use some glucose or corn syrup, too. It gives the syrup body, but we have to add a bit of sulfur dioxide to maintain the color. The syrup absorbs some of the dye and gives the package a very attractive appearance. Until recently it did, anyway."

"Does it make any difference whether you use cane sugar or beet sugar?" asked Mac.

"No," said Wade emphatically.

"It's almost impossible to tell the difference nowadays. In fact, there is no real difference."

"Can it be in the sugar?"

"Not there," said Wade. "Sugar is the same, year in and year out. We even take the precaution to store it at a fixed temperature and humidity, so that we don't have any loss from caking." He shook his head. "No. You'll have to guess again."

"How about that corn syrup?" Mac asked.

Wade shook his head.

The three sat silently for some minutes. Finally, Mac got up, preparing to leave. "I guess I'll have to let you fellows work out your own salvation," he said. "I still think something has been changed in this process. These things don't happen by magic."

He grinned at the disconsolate pair as he turned toward the door. There stood Selmer Brown, who said firmly, "Nothing was changed."

Mac eyed him for a moment. "You said that you repiped the plant." He paused. "Did you repipe the sugar line, too?"

Changed Sugar Tank and Piping

"Sure. Part of the roof fell in and carried the sugar tank and the piping down with it. That old tank looked pretty funny the way the tin melted off the inside. Darn thing had a big bulge in one side, too. Had to scrap it and get a new one. This one is almost twice as big." Selmer became affable. "We used solder joint fittings in the piping this time, so we got rid of gasket trouble, too."

"How do you make the sugar syrup?" Mac asked slowly.

"We use distilled water for that," said Joe. "The solution is made at 180 F, and Wade is the boy who tells us when it is exactly right. So many pounds of sugar and so many gallons of distillate. We seldom miss, although 'Hawkeye' does catch us once in a while."

Mac still has a puzzled look. He took his seat again. Turning to Wade, he asked, "Is this solution kept hot all the time?"

"No," answered the chemist. "We make up enough for a run of cherries. It may take several days to work them through. The bottles are filled with the fruit and the syrup solution is filled in. They are brought up to 180 F during processing and are capped hot. Some people use a preservative, but we prefer to pasteurize."

"Any chance of anything getting into the solution in the process of filling?" Mac had the feeling that something was eluding him, and he did not like it. But the confidence of the others made him hesitate to persue the matter further.

"Listen, fellows," exploded Joe. "There's something wrong here somewhere. We've simply got to find it and soon. Mac says that something has changed. I agree with him. Let's stop acting as though we couldn't possibly be wrong. Something changed. What?"

There was silence and a feeling of embarrassment in the room.

"Wade ought to be able to find what makes the color change," Selmer declared finally. "It's a chemical problem, as I see it."

"Darn it," expostulated the chemist, "I've tried everything I can think of to make that dye change to that dark color. I admit that I'm stumpped." He shook his head. "I've gone over that process time and again until I dream about it."

"Tin," said Mac, thoughtfully gazing at the ceiling. He turned his gaze on Selmer, now sitting on the edge of Joe's desk. "I suppose you used a tinned tank again?" he asked speculatively.

Tin Replaced by Copper

"Gosh, no," smiled the burly superintendent. "That old equipment was here when we got the plant, but when we rebuilt, we put in bright new copper. Tank, pipe, and all."

Mac looked questioningly at Wade, who shook his head. "That would not make any difference," he said. "In the old days, they all followed the distilleries and tinned everything.

"Not too bad an idea, if you ask me," said Mac.

"Darned expensive, though," replied Wade.

"I take it that the original pipe was tinned, too," said Mac, eyeing Selmer shrewdly.

"Oh, yes. All the piping in the plant was tinned copper before the fire," answered Selmer. Joe jumped up suddenly, shouting, "There's your change, fellows. Mac was right." He looked hard at Wade. "You say that it doesn't make any difference. Are you sure?"

"I don't see how it can, Joe. There's nothing in that line but our sugar solution, and that is made with distilled water which we distill ourselves. I don't see how that copper line could make any difference."

Use Sulfurous Acid Bleach

"Could the fact that they bleach sugar with sulfurous acid possibly have any bearing?" asked Mac.

Wade looked startled. "What's that you say?"

"If my memory serves me correctly, they use sulfur dioxide in the making of both cane and beet sugar. And they give the finished sugar a wash with a weak solution of sulfurous acid to get the pure white color before they send it to the driers. I'm not too sure of this, but I've a hazy recollection of some such thing," said Mac.

"Wait a m-i-n-u-t-e," slowly cautioned Wade. "A light begins to dawn. If there is possibly any residual H_2SO_3 lingering in that sugar, it might be the answer we are looking for. Selmer, get me a bottle of that sucrose syrup. Come on into the lab, you fellows. I'm thinking that we've found something, thanks to Mr. MacVane."

He picked up two bottles of the cherries, one a brilliant red and the other a dull muddy black. "If this proves out, Mr. Stoddard," he said to Joe, "you are in for spending some more money."

"Gee whiz," laughed Joe with a touch of hysteria. "I'll find the dough,

if you'll find a way for us to get back our market."

Blue Litmus Turns Pink

Selmer came into the lab with a milk bottle full of clear white syrup. Wade filled a large test tube, and, taking one of the little slips of bluish paper he had in a little bottle, he dropped it into the clear colorless liquid.

"I'll be darned," he exclaimed, as the group watched the tube intently. "That litmus is changing to pink. See the blue fading? Completely. Look at that, will you?" He shook the tube gently. "There's a trace of acid there, all right. It's mighty little, but maybe this is the real trouble."

He took another test tube and extracted some of the syrup from the bottle of bright cherries. Reaching for one of the bottles in the row above the bench, he dropped a few drops into the red liquid. "This is it," he declared, as the intent group saw the color change from red to a murky bluish solution. "There's copper sulfate here, or I'm a monkey's uncle."

"All right, Mr. Chemist. Explain, will you? What's it all about?" asked Joe.

Copper Sulfate Turns Cherries

"If, as is indicated here by this litmus paper," explained Wade, "there is any residue of sulfurous acid present in the sugar syrup that comes in contact with the copper tank or pipe, there is a possibility of its attacking the copper and producing copper sulfate, $CuSO_4$. You probably know this as blue vitriol."

Wade picked up the last tube that he had tried. "Here is evidence that this is just what has happened. I added a couple of drops of ammonium hydroxide to that syrup, and you can see that the bluish tint of copper is present, even though the red color obscures it." He set down the tube.

Going across the room, Wade put some dark powder into another tube. "Let's make a very weak dye," he said. "I'll add a little distilled water. Beautiful red, isn't it?"

The others nodded. Wade went on with his experiment. A drop of liquid from a bottle containing a bluish solution suddenly turned the dye almost black. "So," murmured Wade under his breath while the others gazed in astonishment, "that tin was more than decorative, Selmer." Turning to Mac, he put out his hand. "Thanks for the tip, Mr. MacVane," he said. "This blue vitriol in this tube gives us the answer."

Everyone was pleased. Joe turned to thank Mac, but in the confusion he had silently slipped away. Joe looked at Selmer.

"Something changed all right," he said. "Let's get busy." ⧺

Package Air Conditioning Serves College Library

SUMMER STUDENTS at Peabody college, Nashville, Tenn., now enjoy an air conditioned library, chiefly because an unusual demonstration changed an opinion held by school officials, according to the Airtemp Div. of Chrysler Corp.

Recognizing the need of a comfortable library conducive to study in warm months, the administration formulated plans calling for air conditioning. The school made one stipulation: "We don't want package air conditioners in the library because they are too noisy, and we don't want exposed ductwork."

But, today, a system of package units with simple sound baffling is installed in the library without ductwork.

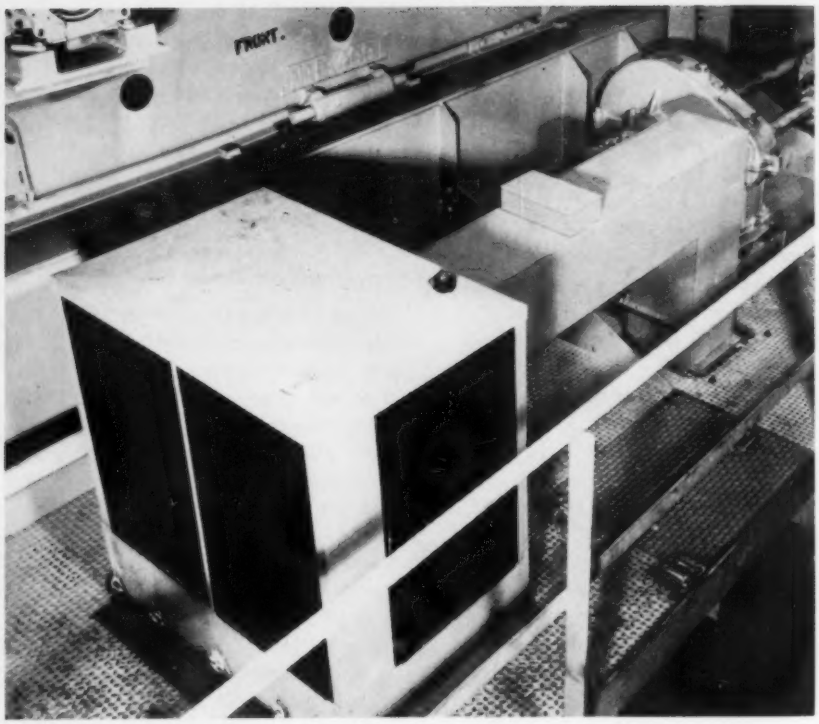
What changed the opinion? Dr. Henry Hill, Peabody president, not convinced that the noise problem could be solved so easily — he had tried to lecture for several semesters in a classroom served by a package unit — expressed a desire to observe actual proof. To enable him to do so, sound baffling was built around the old classroom unit. Entering the room he asked, "When are you going to turn on the air conditioner?" When told the unit was already in operation, he couldn't believe it. The dramatic demonstration was enough.

The new library system consists of nine 3 ton and nine 5 ton water cooled package air conditioners. In the main reading rooms, the units are in corner areas. Diffusers are just above the conditioners, which are enclosed in sound baffle closets. In the smaller rooms of the building, a similar system with sound baffle closets is used, with the exception that there is an occasional short run of ductwork where one conditioner serves more than one office.

A 5 hp waterless air conditioner was selected for the library's book storage area because the section would — for dehumidification and moisture control — require air conditioning during periods when the main system would not be needed and perhaps after the building's cooling tower had been drained for the season.

Central Air Conditioning and Heating, Nashville, was the contractor. ⧺

AIR CONDITIONED READING ROOM, one of several in Peabody college library, has two water cooled package air conditioners housed in sound baffle closets by window



EVAPORATIVE COOLER installed on a traveling crane to cool the cab has activated charcoal filters to trap smelter fumes. Electric strip heaters in the duct provide comfortable temperatures in winter

Cool Industry Hot Spots With Evaporative Coolers

By Robert S. Ash

Assistant to the President, International Metal Products Co.

For successful operation and low maintenance, the water mineral concentration requires careful attention. An equation for the bleedoff rate is given.

WHILE evaporative cooling, using all outside air, finds its chief application in comfort cooling, there are many uses for it in the field of industrial air conditioning. Evaporative cooling will often improve working conditions or processes.

To even approach outdoor conditions during the summer in a factory with a large internal heat load would require an infinite quantity of outside air. Through evaporative cooling, using only reasonable air quantities, the temperature in the plant may be lowered from 5 to 10 F below the prevailing outdoor temperature.

In the rubber industry, the hot areas around the tire presses and mills may be spot cooled. And in the department handling volatile and inflammable solvents, evaporative coolers may be used for maintaining sufficiently high humidity to prevent explosion producing static conditions. Other examples are printing and lithography, which impose humidity control requirements to maintain accurately the size of paper and other materials. Also in the textile field, especially in rayons and synthetic yarn plants, as well as in cotton mills and garment factories, evaporative coolers are supplying millions of cubic feet of cool washed air.

Spot Condition Hot Areas

Many industrial processes create localized hot areas which present exceedingly difficult working conditions. Examples are heat treating and annealing departments, the discharge end of bake ovens and around porcelain enameling furnaces. Evaporative cooling applied at these hot spots where the workers are required to stand provides relief, contributes to efficiency, and improves employee morale.

The cooling system for spot conditioning should be designed to direct the cool air to the working zone, and there should be some means of manual control to direct the air where it is desired.

An evaporative cooler installed on an electic traveling crane to cool the crane cab is shown above. A number of installations of this kind have been made in copper smelters. To

overcome the sulfur fumes that would be drawn into the cab by the cooler, activated charcoal filters precede the cooler saturation pads. Since warm air is required during the winter months to heat the cab, electric strip heaters are installed in the ductwork leading from the cooler. A control panel was installed in the cab to enable the crane operator to vary the air volume as needed, and to control the amount of cooling and heating desired. Since water connections could not be made without sacrificing the mobility of the crane, the cooler was furnished with a large capacity water reservoir that is manually fed through a fill pipe in the top of the cooler cabinet.

Cool Make-up Air

In many industrial processes, large quantities of air are exhausted from paint spray booths, chemical hoods, open tanks, and ovens. Of course, it is necessary to replace this air. Evaporative coolers may be used to good advantage in furnishing a controlled, positive supply of clean make-up air, thus barring the infiltration of hot dirt-laden outside air. At best, mechanical ventilation can only supply outdoor air at the prevailing temperature, which is often too high to be particularly effective. Although refrigeration systems can be used, the cost may be prohibitive, especially in view of the large volume of make-up air required.

Evaporative cooling can also be applied to the cooling of continuously produced materials in tunnels and on tables to accelerate production. Examples of this application are rubber slabs or granules from the mill, bread from ovens, and plastics from extruders and molds. Evaporative coolers are also being used to cool parts received from paint and enameling ovens to speed up assembly time in production plants.

Cool Electric, Diesel Motors

The public utility industry, as well as plants with their own generating systems, represent another excellent application for evaporative cooling of generators, motors, transformers, and diesel engines. The rating of electrical generators and motors is generally based on a maximum ambient temperature of 40 C or 104 F. If this temperature is exceeded—a condition that often prevails during the summer months — excessive temperatures will develop in the electrical windings unless the load on the motor or generator is reduced. If air is supplied to the windings by an evaporative cooler, this equipment may be safely operated without reducing the load and, in many cases, an overload may be carried. The permissible overload on the average alternator is about 6 percent for each 10 F below the rated ambient temperature. Air supplied at 80 F by the cooler will permit motors and generators to be operated at approximately 14 percent overload without exceeding the normal temperature in the windings. Transformer capacity can, in like manner, be increased through the use of evaporative cooling. Diesel engine radiator cooling is another application, especially in areas characterized by high temperatures such as in the valleys of California and southern Arizona.

Check Water Concentration

However, like all mechanical equipment installed and operated by industry, evaporative coolers require care, and attention must be paid to maintenance. Due to the basic simplicity of evaporative cooling systems, there has been a tendency to overlook operation and maintenance. In addition to the usual routine preventive maintenance program that is common for motors and fans, attention must be paid to the water distribution system of evaporative coolers if successful operation is to be maintained. Most evaporative cooling systems are installed with recirculating pumps to conserve water. If a cooler is furnished with such a pump it is necessary to provide a method of bleedoff.

Control of mineral concentration in the recirculated water of evaporative coolers is absolutely essential for successful operation. Evaporation of the sump water increases the concentration of the dissolved minerals. These uncontrolled concentrations result in the precipitation of calcium and magnesium carbonate scale as the sump water becomes saturated with minerals. The accumulation of scale reduces air flow and cooling, as well as causing a general fouling up of the cooler.

The seriousness of this problem may be graphically illustrated by the actual build up in the mineral concentration in a typical evaporative cooler. A 6000 cfm cooler using recirculated water with a 20 grain hardness may precipitate over 50 lb of salt in one season's use. Obviously, the use of a bleedoff is absolutely essential if good cooler performance and minimum maintenance are to be achieved. By continually drawing off a portion of the sump water so that the mineral concentration does not become high enough to cause scale deposits, the scale problem can be controlled to a large extent.

The bleedoff rate for evaporative cooling equipment may be determined from the formula:

$$B = [C_1/(C_2 - C_1)]\ E \quad \ldots\ldots\ldots [1]$$

where B = bleedoff rate in gal per hr; C_1 = hardness of supply water in grains per gal; C_2 = hardness of sump water in grains per gal; and E = rate of evaporation in gal per hr.

To use this formula, a water analysis must be made to determine hardness and chloride concentration of the supply water. Since chlorides are highly soluble, the increase in chlorides in the sump water may be used as a safe index of the extent to which reconcentration of solids is taking place. If a water analysis of the sump water shows that the actual hardness is less than the reconcentration indicated by the chlorides, salt is being precipitated in the cooler and the rate of bleedoff should be increased.

In those installations that do not economically justify water analysis, control of scaling can usually be obtained by bleeding off at a rate equivalent to one-half the amount of water evaporated. This will approximate 1 gal per hr per 1000 cfm and will give a reconcentration of solids three times that of the supply water.

Illinois School Gets Major

Twenty-one miles of copper tube hot water panel heating serve new one story, basementless school of contemporary functional design. Coils are embedded 2½ in. deep in concrete, covered with asphalt tile. Gymnasium is heated by unit heaters on a separate circuit.

By James F. Redding

Midwest Representative, Copper & Brass Research Assn.

ONE of the major radiant heating installations using copper tube in public schools in Illinois was recently completed for the new $500,000 Staunton community elementary school.

About 21 miles of copper tube were used for the radiant heating system, water supply, and other purposes. The radiant heating system required about 100,000 lineal ft of copper tube alone. The copper tube panels for the radiant heating cover a floor area of 3½ acres.

The Staunton school is of contemporary functional design and in its rambling length takes on the form of a broken letter E. One story and basementless, the rambling 70 × 520 ft building is on flat terrain with ample space for playgrounds and athletic fields. The walls are of lightweight concrete block with brick facing. Window areas from ceilings nearly to floors line the sides of all rooms. Room walls are of painted concrete block.

Coil Base Is Deep Sand

Floors in which copper tube panels are embedded are of poured concrete slab with asphalt tile topping. The radiant heating system is sectioned into eight zones. Floor panel coils, of ¾ in. hard copper tube, were prefabricated to specification at the factory.

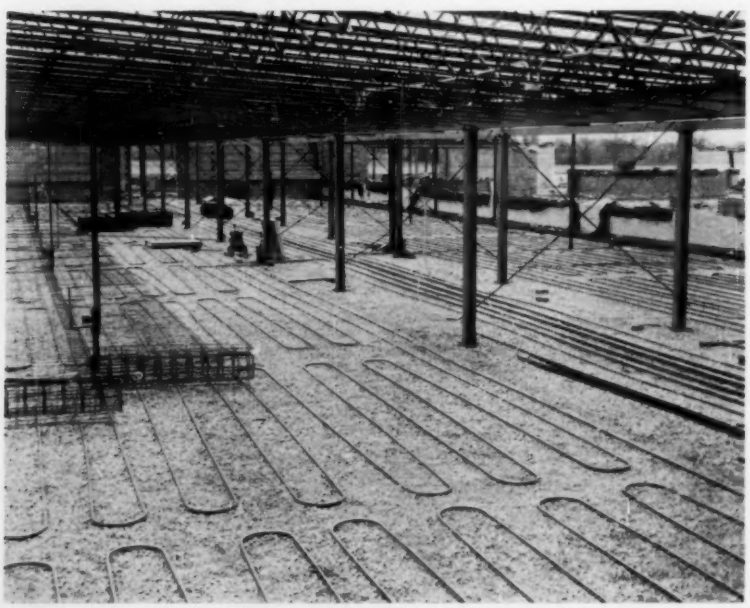
The preparation of the base for the copper tube coils included a deep fill of washed sand, with a 6 in. covering of crushed sandstone. Felt insulation mats, 2 × 36 × 36 in. were laid at the outer walls of the building to reduce heat loss. The panels were embedded in a 5 in. concrete slab. The edge construction of the concrete slab floor has a 1 × 36 in. perimeter insulation installed horizontally under the slab.

All copper tube coils were "swedged," fluxed, and soldered with a 95-5 solder.

In the main service and flow return lines, are copper fittings for tube connections. Flow and return lines are of 1½, 2, and 2½ in diameter. All service, flow, and return tubes are of hard copper, as in the panels.

Calculations for zone No. 1, typical of all eight zones, are as follows: heat loss = 208,000 Btu per hr; maximum slab temperature = 85 F; panel output = 56.5 Btu per hr per sq ft; floor area = 4600 sq ft. Therefore, heat input = 56.5 × 4600 = 260,000 Btu per hr.

Average water temperature for 12 in. coil spacing and 2.5 in. concrete cover is 115 F. Flow rates are based on a temperature drop of 20 F through the coils. Two 90 gpm pumps are installed.

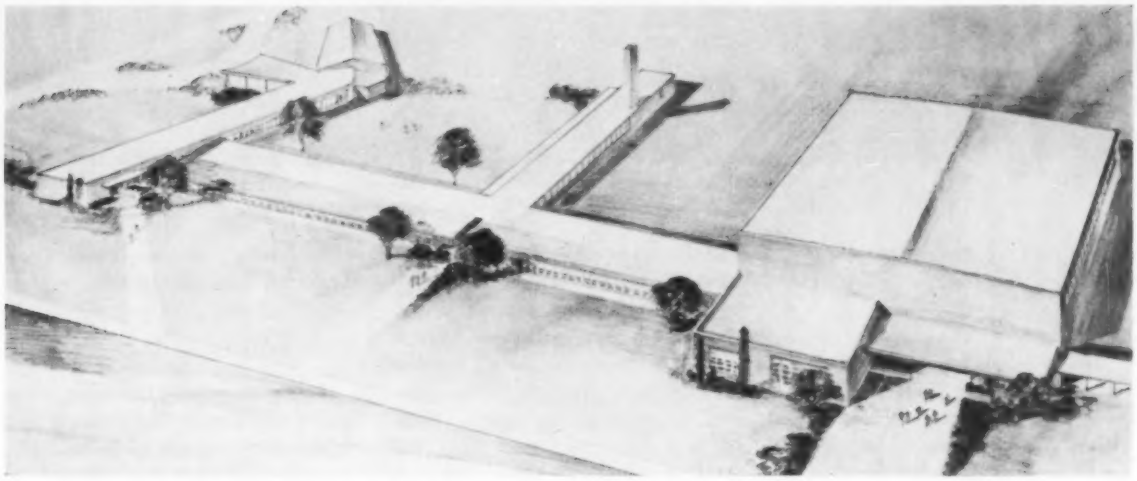


HOT WATER HEATING PANELS of copper tube stretch out for a total of 21 miles in length in the new Staunton, Ill., elementary school

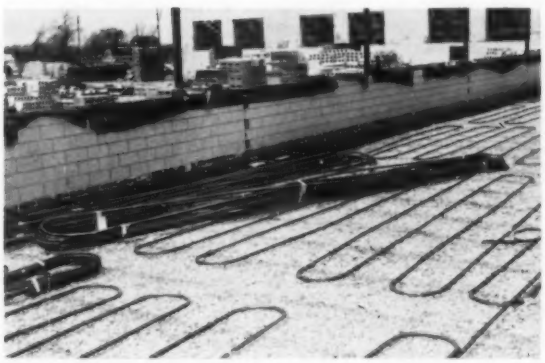
Each Zone Has 13 Circuits

Each of the eight zones of the system has an average of 13 separate circuits. Each is controlled by a bal-

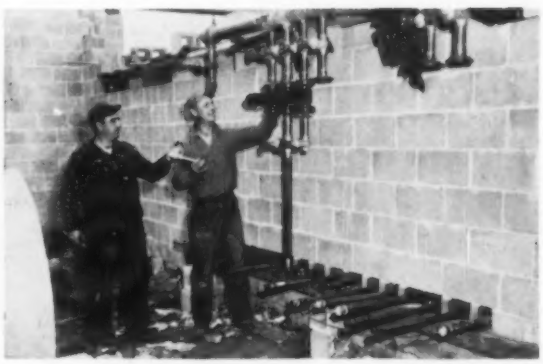
Panel Heating Installation



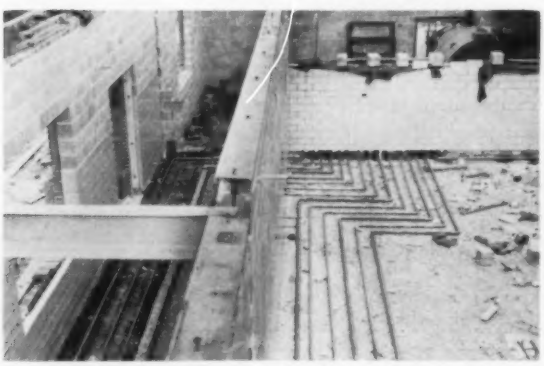
NEW SCHOOL is E shaped structure which covers 59,000 sq ft. Boiler room is in center wing. Gym at right is heated by unit heaters



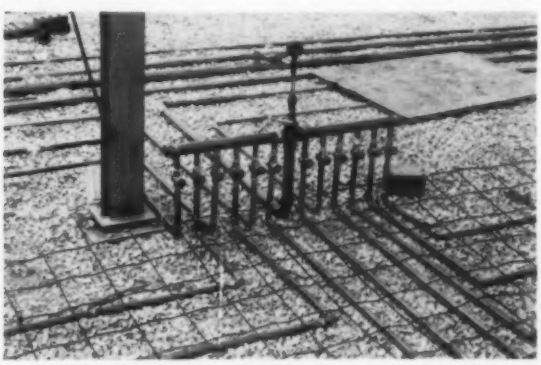
HARD COPPER TUBE, ¾ in. in diameter, lies in stacks in this view before installation



MOTORIZED VALVE CONTROL SYSTEM is installed at heads of supply and return mains in boiler room



SUPPLY LINES stretch out from boiler room — upper right — to connect and service all zones



ZONE CONTROL consists of a balancing cock connected to a motorized valve control

RAMBLING E-SHAPED Staunton community elementary school undergoes preparations for an early opening. Portico near left is main entrance.

ancing cock which is connected to a motorized valve control in the boiler room.

The boiler room temperature is controlled by an outside comfort control with capillary tube. The boiler room is in the center of the building and forms part of the middle bar of the E shape of the building. Thus, it functions for the entire system and especially for the demands of the extreme ends of the building. One oil fired package boiler burning No. 5 oil is installed. The estimated fuel consumption is 36,000 gal per year.

Installation Was No Problem

The installation presented no major problems. How to zone was the principal question, in order to insure adequate heating in remote areas and serve those areas where heat losses were greater. The building is not ventilated other than by the ventilation provided by the opening and closing of bottom hinged windows in classrooms. The division of the building into eight zones solved these questions.

The school plan consists of 16 classrooms and two kindergarten rooms. A large playroom is attached to the primary section. At the other extreme end of the building is a gymnasium with a basketball court and spectator seating facilities. Corridors extend through the center of the building.

The roof of the building is of lightweight poured gypsum slab, insulated above, and with a pitch and tar topping. It is sustained by plywood membrane on inverted steel T's.

TABLE 1—HEAT INPUT for the eight zones of the new Staunton, Ill., school totals 1,780,000 Btu per hr. This includes the reverse heat loss from the panels, but not that of the gymnasium, which is heated by unit heaters on a separate circuit.

Zone No.	Heat Input, Btu per hr	Area, sq ft
1	260,000	4600
2	180,000	3750
3	210,000	4480
4	220,000	4600
5	260,000	5500
6	200,000	4520
7	250,000	5670
8	200,000	4400
Totals	1,780,000	37,320

Each Zone Has a Thermostat

An inside-outside controller is installed to control the water boiler temperature and the oil burner. One water temperature is circulated for the eight zones, with the temperature being adjusted for the zone having the maximum load. A thermostat is installed in each zone which operates a control valve which regulates the water temperature for the zone.

The total cost of the radiant heating system and including unit heaters in the gymnasium was $56,065. with a total area of 59,000 sq ft, including the gymnasium, the cost is approximately 90c per sq ft for the heating system.

The general contractor was Central States Construction & Equipment Co. The architect was Edward A. Kane. Ferris & Hamig were the consulting engineers. The heating contractor was the C. A. Napier Co. ∓

Seek to Extend Steam Table to 1500 F and 15,000 Psia

. . . also launch corrosion study

THE Steam Properties Research Program sponsored by the American Society of Mechanical Engineers has received a grant from the Engineering Foundation.

This program, established at the Fourth International Steam Tables Conference last year, revives an earlier ASME program that was completed in 1934. The extremely high pressures and temperatures commonly used today emphasize the need for extending the present working steam tables that have been in use since 1934.

As a first step, the research program will try to obtain experimental data for extending the steam table range to 1500 F and 15,000 psia.

Also receiving support from the Engineering Foundation and the American Society for Testing Materials is the ASME project on High Temperature Steam Generation. Target of this program is to lower electric power costs still further by studying the possibility of using a regenerative steam cycle at temperatures up to 1650 F. Of particular concern are the severe corrosive action of high temperature steam and the lack of metallurgical stability of the materials available for superheater tubing.

This project, begun in 1932, was dropped during the war and reestablished in 1949. ∓

Forced Air Heaters Replace Pot Belly Stoves

. . . save $6732 gross first year in plant

THIRTY-TWO old fashioned, hand fired coal stoves have been replaced by 11 modern, gas fired, forced air space heaters, with substantial savings, by the Ideal Electric and Manufacturing Co., Mansfield, Ohio, according to the Dravo Corp. During the first heating season, a gross saving of $6732 was realized.

After amortization charges had been figured on the new heaters and standby equipment over a 10 year period, a net saving of $2735 was possible. When fully amortized, saving should exceed $6000 annually.

Founded in 1903, the plant expanded as business developed. Uninsulated brick, glass, and sheet metal additions went up, until today there are 7 acres of work space under roof. The heating problem grew along with expansion, and more and more coal fired stoves were added.

Experience proved this method of heating costly to maintain, inefficient in service, and excessive in floor space requirements. For every stove, too, a nearby coal bin was needed.

The plant, by the nature of its construction, had always posed a major heating problem. The stoves did not heat the plant uniformly. Workers near the stoves were too hot, while those some distance away were too cold. Labor costs were excessive, as it required almost full time services of five men to keep the stoves fired around the clock. Two men were used on the first shift, two on the second, and one on the midnight turn. The 32 stoves and their bins occupied more than 4000 sq ft of valuable floor space.

The main floor of the plant is 400 by 400 ft, with five high bays. Roofs are built-up, 40 ft high at the center. Side bays are 20 ft high. In addition, adjoining areas total 40,000 sq ft.

The measurable cost in heating this area the final winter with the old stoves was $19,000, of which $10,000 went for labor.

Of the 11 new gas fired, forced air heaters, seven have rated outputs of 1 million Btu per hr and handle 11,000 cfm of heated air. Four units each have an output of 750,000 Btu per hr and handle 8500 cfm of heated air. Space required for all 11 is only 600 sq ft, compared to the 4000 sq ft for the stoves and bins.

An outdoor tank farm of standby propane gas is on hand, should the natural gas supply be interrupted for any reason. ⧺

HAND FIRED STOVES and coal bins took up 4000 sq ft of floor space. Heat was not uniform, operating costs were high

FORCED AIR HEATERS achieved a gross saving of $6732 the first season and released over 3400 sq ft of valuable space

How to Control High Velocity Double Duct Systems

• **It's easy to control double duct high velocity air distribution systems for year 'round air conditioning, says the author. Some of the steps involved are maintaining static pressure balance, controlling fan volume, locating static pressure sensing tips, and selecting temperature controls. The first two were discussed in the November HPAC. The rest are covered here.**

By Norman J. Janisse

Assistant Chief Field Engineer, Johnson Service Co.

controlling static pressure

THE USE of differential static pressure regulators to operate dampers at the inlet to the two main ducts is the basic established method for maintaining the static pressure at a fairly constant level throughout the duct system. The ideal location for the static pressure sensing station varies with every system. Usually, it it installed so that approximately an equal number of mixing units are on the downstream and upstream sides of the control station, thereby insuring a minimum change in static pressure at the majority of the mixing units whenever the system load changes.

Beneficial results that can be obtained with static pressure control are shown in Fig. 6. Using the same double duct high velocity single fan system (November HPAC), assume that the static pressure regulators are at points 2 and 6 in the main ducts. Also, assume that the regulators are set to maintain the static pressure at these points at 3 in. WG. This means that the static pressure at points 2 and 6 remains at 3 in. WG when the system load changes from Condition Y to Condition Z or vice versa.

As noted earlier, the main reasons for static pressure control are to minimize the change in static pressure within the system at all times, especially during sudden load changes, and to prevent excessive buildups in static pressure in ducts through which very little air is flowing. If static pressure control is used, there is no variation in static pressure at points 2 and 6 — see Fig. 6 — when the load changes from Condition Y to Condition Z. In the uncontrolled system, the variations at these two points are 0.35 and 0.95 in. WG, respectively.

A comparison of the figures for other points in the system shows that, as the load changes from Condition Y to Condition Z, the variations in static pressure within the controlled system are much less than those found in the uncontrolled system. Also, with this arrangement, the static pressure at the fan outlet remains more nearly constant and variations in fan volume are minimized.

If this control arrangement is refined to include fan volume control in conjunction with static pressure control, the static pressures within a double duct high velocity system using a single supply fan will not vary enough to noticeably affect the quantity of air being distributed by the mixing units in any part of the system.

a) single-fan system

There are differences of opinion regarding the manner in which static pressure regulators and static dampers should be employed in a single fan double duct high velocity system. In some systems, only one differential static pressure regulator is used in an attempt to control the static pressure in both main ducts by operating dampers in the inlet to each duct. While this control method insures an equal static pressure in both ducts, there is no assurance that this static pressure will be the same as the originally intended value. This means that the total volume of air being distributed to the mixing units will vary, often resulting in changing air flow patterns from the mixing units.

This varying static level can be overcome by installing a second regulator that maintains a constant static pressure in one of the ducts, and hence maintains the entire system at a constant level. However, this solution necessitates the use of two static pressure regulators and two sets of dampers, which is the same amount of equipment needed for a more logical solution — the control of static pressure in each duct separately.

As already pointed out, static pressure control in zones where the load remains relatively constant does not present a serious problem. For such zones, fan capacity control usually permits satisfactory operation with very little variation in static pressures throughout the system. However, for instantaneous control of the distribution of air throughout the system, the method shown in Fig. 7 provides the most satisfactory arrangement.

b) two-fan system

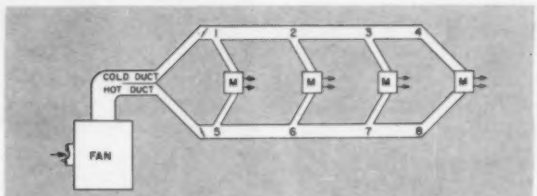
When one fan is used to supply the hot air and another fan is used to supply the cold air, each fan system must be handled separately when control methods are being considered.

In a two-fan system, the air in one duct cannot be shifted to the other duct. Consequently, if the quantity of hot air needed to satisfy the load in the conditioned area decreases, the capacity of the fan serving the hot duct should be decreased correspondingly. If no fan volume control is provided, the decrease in air flow accompanies an increase in static pressure. The rise in static pressure tends to increase the rate of air flow through any constant opening in the hot duct, which is an effect not desired.

For example, when the thermostat controlling the operation of a particular mixing unit senses the rise in temperature produced by this increase in flow of hot air, its respective valving device or damper is modulated towards its closed position. Throttling the rate of flow to a number of these units further increases the static pressures in the rest of the system and the flow through the other valving devices. The double duct system thus becomes an unstable system in which changing rates of air flow force previously satisfied thermostats to initiate corrective action.

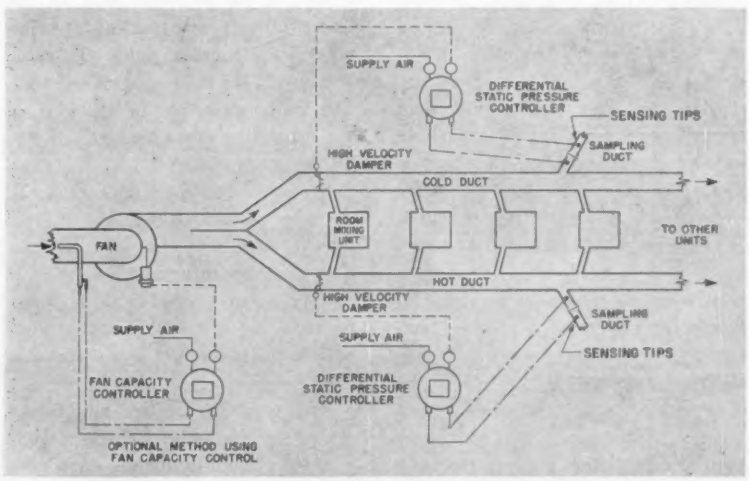
This unstable situation can be eliminated by using a static pressure regulator to control fan capacity by means of inlet vanes or fluid couplings. In a system equipped with a supply fan for each main duct, an independent static pressure or fan volume control is required for each duct.

Such a control arrangement prevents duct static pressure variations which have a harmful effect on the air flow rate through the ducts or mixing units. Control of static pressure in each main duct provides a rapid means of preventing the changing needs of one or more portions of the system from affecting the operation of the rest of the system.

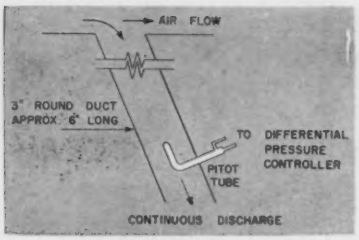


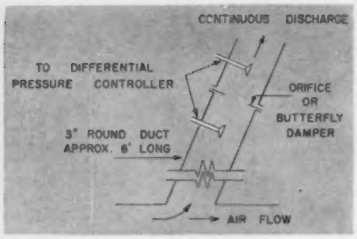
		STATIC PRESSURE (IN WG)							
		COLD DUCT				HOT DUCT			
	POINTS IN DUCTS	1	2	3	4	5	6	7	8
NO CONTROL PROVIDED	CONDITION Y 75 % COLD AIR 25 % HOT AIR	3.5	2.7	2.0	1.30	3.8	3.3	3.15	3.0
	CONDITION Z 50 % COLD AIR 50 % HOT AIR	3.0	2.35	1.75	1.25	3.0	2.35	1.75	1.25
	DIFFERENCE IN STATIC PRESSURE BETWEEN BOTH LOAD CONDITIONS	0.5	0.35	0.25	0.05	0.8	0.95	1.40	1.75
STATIC PRESSURE CONTROL PROVIDED	CONDITION Y 75 % COLD AIR 25 % HOT AIR	3.8	3.0	2.3	1.6	3.2	3.0	2.85	2.7
	CONDITION Z 50 % COLD AIR 50 % HOT AIR	3.65	3.0	2.4	1.9	3.68	3.0	2.4	1.9
	DIFFERENCE IN STATIC PRESSURE BETWEEN BOTH LOAD CONDITIONS	0.15	0.0	0.1	0.3	0.45	0.0	0.45	0.8

6 BENEFICIAL RESULTS obtained with static pressure control are shown here, comparing static pressure variations in a typical system with and without static pressure control. With control, there is no variation at points 2 and 6 when the load changes



7 DIFFERENTIAL STATIC PRESSURE CONTROL is maintained by two sensing tips in hot and cold sampling ducts. The velocity through the sampling duct is regulated by the differential static pressure controller, which controls a set of dampers at the inlet of the main duct to increase or decrease the duct resistance to maintain a constant static pressure at the junction of the sampling duct and the main duct





8 PITOT TUBE, left, may be used for direct control of velocity in the sampling duct

9 PRESSURE DROP across an orifice may be measured as indirect control of velocity in sampling duct

locating static pressure sensing tips

The function of a differential static pressure controller is to maintain a constant differential in static pressure between two points. A sensing tip is used to measure the static pressure at each point. The natural question for a double duct high velocity system is, "Where should the static pressure sensing tips for each main duct be located?"

For many years, it was common practice to locate one sensing tip of the controller within the duct system and the other tip outdoors or in an area under atmospheric pressure. Two main problems had to be overcome when using this method: (1) the proper location of the tip that sensed static pressure in the duct, and (2) the proper location, design, and mounting arrangement for the tip that sensed atmospheric pressure.

Theoretically, a pressure sensing tip within a duct should be located at least 20 duct diameters downstream and five duct diameters upstream from right angle bends, duct take-offs and other major disturbing influences. This would require a straight duct run 25 duct diameters in length, a condition rarely found.

Consequently, sensing tips sometimes had to be located in straight duct runs in which disturbing influences often were not more than two duct diameters apart. It was therefore impossible to place the sensing tip in the theoretically ideal location. However, even with only two duct diameters between the sensing tip and a disturbing influence, the tip was able to sense a fairly representative duct static pressure and stable control was achieved, but with difficulty.

It was also difficult to find a good location for the tip that sensed atmospheric pressure. For economy reasons, this tip usually had to be near the building and was subject not only to normal wind effects but also to abnormal air turbulence at the building. Special — and sometimes expensive — sensing stations often had to be fabricated.

A newer method for locating the sensing tips eliminates most of the old method problems. It is aptly called the "sampling duct method."

If the static pressure in each main duct is maintained at a constant value, the pressure drop through a mixing unit remains constant, and the flow of air through this outlet does not vary, assuming that the static pressure in the conditioned area remains relatively constant. Conversely, if the pressure drop, or the flow, through any outlet is maintained at a constant value, the static pressure in the duct remains constant. The latter principle is followed in the "sampling duct method" of static pressure control.*

In this method, a duct of small diameter is added to the original duct system. See Fig. 7. The air flow through this sampling duct is maintained at a constant value, thereby assuring a constant static pressure in the main duct at the sampling duct location.

The sampling duct should be installed in the same location recommended previously for the static pressure sensing tip of a differential static pressure controller; that is, approximately midway in the air distribution system. The location of this sampling duct is complicated in some systems where as many as three or four main hot or cold ducts are employed, especially if each duct serves a different type of area. In such cases, it may be difficult to find a suitable location for the sampling duct which would be used to control the average static pressure in all of the hot or cold ducts. It is therefore necessary in such instances to make a thorough study of the entire system so that the best sampling duct locations and number of control points needed can be determined.

As shown in Fig. 7, the velocity through the sampling duct is regulated by a differential static pressure controller, which controls a set of dampers at the inlet of the main duct to increase or decrease the duct resistance by the amount required to maintain a constant static pressure at the junction of the sampling duct and the main duct.

The velocity in the sampling duct can be controlled directly by means of a pitot tube — see Fig. 8 — or indirectly by measuring the pressure drop across an orifice or any other device which produces a pressure drop without introducing excessive turbulence. See Fig. 9. The duct can be small, both in diameter and in length. A diameter as small as 3 in. can be used.

For accurate results, the sensing tips of the static pressure controller should be located approximately 20 duct diameters downstream and five duct diameters upstream from any

*For a discussion of the "sampling duct method" of static pressure control, see "Air Velocity Control as Applied to Heating, Ventilating, and Air Conditioning Systems," by John H. Colby, published by the Instrument Society of America.

major disturbing influence. If the sampling duct has a diameter of 3 in., it need be only approximately 6 ft in length to satisfy this requirement.

Air from the sampling duct should be discharged into a corridor, equipment rooms, or other area not requiring very close temperature control, or into an area which might require hot or cold air at all times. However, the small quantity of air discharged is not sufficient to create an undesirable temperature change. If necessary, a small sound attenuating box can also be installed on the sampling duct outlet to prevent objectionable noise.

selecting temperature controls

One of the basic advantages of a double duct air distribution system is the availability of both heating and cooling for all conditioned areas. This permits extra flexibility and economy in zoning.

If the duct temperatures could be raised or lowered in such a way that approximately equal quantities of hot and cold air are required to satisfy any load, it is apparent that the position of the valving device of each mixing unit would remain practically the same for different loads. Control of duct temperatures in this manner would be highly desirable because it would help to minimize the problem of maintaining the static pressure in the ducts at a constant value. The reasons why this ideal control of duct temperatures can rarely be accomplished are as follows.

In all systems the cold duct temperature normally is controlled at or near the dew point temperature required to maintain the desired relative humidity in the conditioned areas. However, the desired relative humidity can be maintained in a particular area only when that area is being supplied with a sufficient amount of air from the cold duct. During the heating season when no dehumidification is required, the cold duct temperature is sometimes permitted to rise a small amount. In remote cases, it may be considered advisable to satisfy changing loads in a system by varying the cold duct temperature. If this is desired, the humidity requirements — control of the dew point temperature — are satisfied by the cooling or precooling coil, while the cold duct temperature is controlled by the addition of some reheat.

On the other hand, the hot duct temperature is usually varied. The upper limit of the temperature range over which the hot duct can be varied is determined by the capacity of the heating coil. The lower limit depends on the amount of minimum outdoor air required by the system and on whether the cooling coil is located before or after the supply fan. The following methods can be used for readjusting the hot duct temperature:

In zones where the major portion of the zone consists of exterior areas, variations in outdoor temperature are the major cause for variations in load. In line with common practice, it is therefore logical to vary the temperature of the hot duct in accordance with outdoor temperature.

If the system serves interior areas only, some cooling is always required, and the hot duct temperature normally is maintained at approximately the return air temperature. It is not varied according to outdoor temperature because this temperature has little effect on the relatively constant heat loads found in these zones.

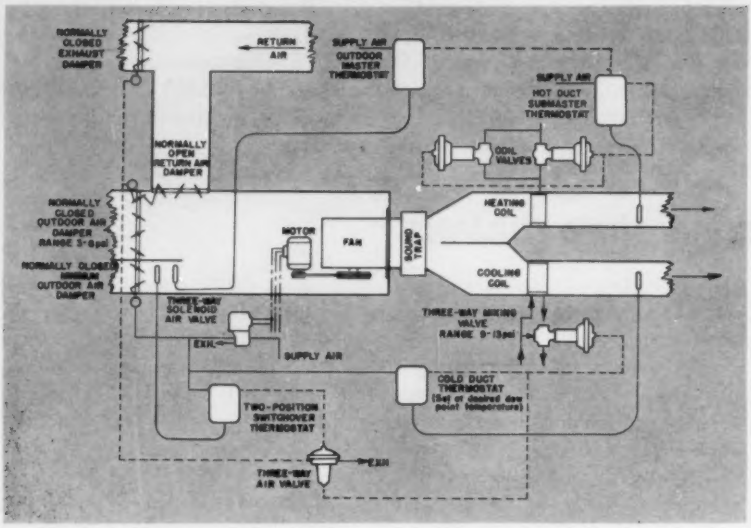
There are other factors besides outdoor temperature which affect the heating load. They include such weather factors as sunshine, wind, and precipitation and such internal influences as varying occupancy loads and heat generated by lights and machinery. However, in the types of buildings where double duct systems find their most common application, these internal factors often remain fairly constant and have a minor effect on the total load.

Methods using other influences besides outdoor temperature for sensing the load can be successfully used to reset the hot duct temperature as an aid to obtaining proper flow distribution or static pressure control within a system. Since every temperature control instrument has an inherent throttling range, the return air temperature will vary slightly when the space thermostat positions the mixing valves or dampers to take in more or less hot air. This slight variation reflects the load condition and can be used to readjust the duct temeprature.

It is also true that, as more and more spaces require less heating and their respective thermostats tend to position the mixing valves or dampers to take less hot air, the static pressure in the hot duct will increase. This variation in duct pressure also reflects the demands on the system and can be used to reset the duct temperature.

When considering a building that has a large north and south exposure plus an interior area, it is conceivable that, on a sunny day in winter, the north area would require a considerable amount of heating, while the south and interior areas would need cooling. Under such conditions, the hot duct temperature must be high enough to satisfy the north zone. The south, or sunny, exposure and the interior area would be taking mostly cool air, especially if the cold duct temperature had been raised above the dew point temperature.

In summer in the same building, the interior area would have no heat gain from external sources; the north area, a slight heat gain; and the south area, a large sun load. Ideally, the hot duct temperature should be readjusted downward so that the cooling requirements of the south zone can be satisfied, keeping in mind that the cold duct temperature cannot economically be readjusted much below the dew point temperature in order to satisfy this load. However, the hot duct temperature cannot be readjusted to a temperature lower than that required to satisfy



10 TEMPERATURE CONTROL for a double duct system shown in this typical arrangement can be modified easily to suit particular applications and requirements

the interior zone, which has no external heat gain.

It is therefore apparent that the limiting areas, such as the north zone in winter and the interior zone in summer in the above example, cannot be discounted when selecting a method for readjusting the duct temperatures. However, it is also apparent that the duct temperatures only can be readjusted to satisfy average conditions. Since any temperature readjustment method selected cannot completely satisfy both the average and extreme conditions, it is logical to select the simplest satisfactory method after thoroughly investigating the requirements of the entire system.

Although this method cannot assure equal air distribution and uniform static pressures within the system — especially during very cold or very hot weather — the system will not be unbalanced seriously because, as mentioned previously, static pressure control and/or fan volume control can compensate for these variations in air flow.

From an economy viewpoint, it is desirable to use outdoor air for cooling in all zones whenever possible. In the heating season, for instance, it is more economical to use outdoor air for maintaining the cold duct at the desired temperature than to operate the refrigeration equipment. The main problem is to determine when and how to switch over from natural to mechanical cooling and vice versa.

A wet bulb thermostat that switches the system from mechanical to natural cooling when the total heat of the outdoor air becomes less than the total heat of the return air can be employed. This method is seldom used because of the maintenance required for this type of thermostat.

A dry bulb switchover thermostat will generally give satisfactory results, while requiring much less maintenance. This thermostat is set to switch the system from mechanical to natural cooling when the outdoor air temperature drops to a predetermined value between the return air dry bulb temperature and the dew point temperature maintained in the cold duct.

Manual switchover can be used wherever a competent operator is in charge of the system's operation. The outdoor condition at which the system is manually switched is usually determined by experience with the particular building.

When the system is switched over to natural cooling, the cold duct thermostat positions the various system dampers so that the fan is supplied with 100 percent outdoor air. When the outdoor temperature drops below the set point of the cold duct thermostat, the dampers are modulated to admit less and less outdoor air into the system until, in very cold weather, a predetermined minimum amount of outdoor air is admitted for ventilation. With the dampers in the latter position, the maximum natural cooling effect available from the outdoor air naturally is dependent on the control of the preheat coil, used for protection against coil freeze-up.

A typical arrangement for controlling the duct temperatures in a double duct high velocity system is shown in Fig. 10. The hot duct temperature is controlled by the submaster hot duct thermostat, which operates the parallel valves on the heating coil in sequence. The control point of this thermostat is reset by the outdoor master thermostat according to a predetermined schedule.

The air in the cold duct is maintained at the desirable dew point temperature by the cold duct thermostat, which operates a three-way mixing valve on the cooling coil. At a predetermined outdoor temperature, the system is switched to natural cooling by the two-position switchover thermostat. When outdoor air is used for cooling, the cold duct thermostat controls the operation of the outdoor air dampers and, through use of the three-way air valve, the return air dampers and exhaust dampers. This thermostat also controls the operation of the cooling coil if and when mechanical cooling is required. The minimum outdoor air damper is open whenever the fan is running.

The simple control arrangement in Fig. 10 can be modified easily to suit particular applications and requirements. ∓

MACHINE SHOP producing metal parts with close tolerances depends on 20 ton package air conditioner to maintain controlled environment. Via ducts, unit supplies plant's critical spots and offices

Air Conditioning Solves Machine Shop Tool Problem

By Harry Dodson
Dornson Corp.

• Expansion and contraction of precision metal parts caused the rejection of many until atmospheric conditions in the plant were stabilized. Now the required close tolerances are maintained and employee efficiency has increased.

AIR CONDITIONING our plant was a mechanical necessity. We specialize in precision machining at very close tolerances. Many parts and tools that we work on are jobs that the average machine shop will not touch, because of the very close tolerances.

We had one special job over a year ago that was giving us a real headache. Investigating it, we found that the parts produced early in the morning would pass inspection, but those produced in the afternoon would be rejected.

Inspection was at the customer's plant, where temperatures were controlled within a range from 69 F to 72 F. In our plant the temperature in the morning would run from 69 F to 75 F, but by afternoon the temperatures in our shop would be up to 85 F and 90 F, caused by lights, people, and motors.

The expansion and contraction of metal parts — particularly aluminum — produced by our jig borer vitally affected close tolerances. Under 68 F to 70 F temperatures the jig operates within a tolerance of 0.0001 in. But at higher temperatures over a 15 F range, variations of 0.0008 in. were noted.

With the installation of air conditioning, the problems of metal expansion and contraction were eliminated. Equipment consists of a 20 ton package unit with ducts leading to supply outlets at critical spots.

The office area is also air conditioned by this unit. A motorized, thermostat controlled damper is situated in the ductwork to control the distribution of cool air to the office area, as the lower temperatures required in the plant are not necessary for office comfort.

Although the building is less than 3 miles from the Pacific Ocean — therefore in the California coast's "cool zone" — air conditioning was nevertheless required to maintain the proper temperature conditions.

In addition to the elimination of mechanical problems, employees are pleased with the comfortable conditions they now work in, and morale and efficiency have improved. ≠

Question of the Month

Why Does Vacuum Pump Clatter?

THE QUESTION, *Why Does Vacuum Heating Pump Clatter?*, was asked previously in HPAC and is repeated here along with answers that have been received. Other comments for publication will also be welcome.

"We have a steam driven double acting vacuum return line heating pump that has given noise troubles since it was moved to the boiler room from a room about 160 ft away and 8 ft lower in elevation.

"Previously, when the pump offered no problems, it received condensate from the 15,000 sq ft of radiation by gravity and delivered it up the sloping incline of 160 ft of 2½ in. return line to the boiler room. Now the pump races and clatters at certain times.

I would like to know what is causing the trouble, and if it can be corrected without returning the pump to the lower elevation."—G. A. N.

H. B. WAYNE —

"Need Tight Piping; Raise Between Receiver, Boiler"

G.A.N. DOES NOT mention the steam pressure nor vacuum, nor does he indicate size of pump suction piping. When selecting vacuum pumps for heating systems, the usual practice is to allow 1 lb per hr of condensate per square foot of direct radiation and choose pump displacement to exceed this quantity four to five times to allow for handling condensate and air. With these assumptions, 15,000 square feet of radiation requires a pump capacity of approximately 150 gpm.

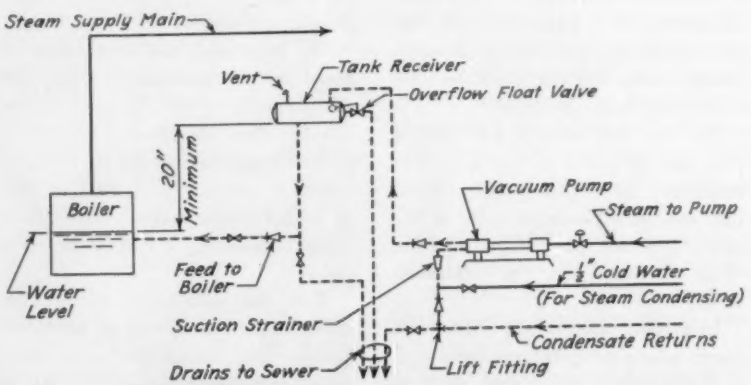
Since air vent valves are not installed on the radiators of a vacuum heating system, a pump designed for this service should be capable of handling condensate and air. The return end of each radiator usually has a radiator trap of the thermostatic type.

A volatile fluid contained inside the thermostatic bellows causes the bellows to expand and close the valve. The temperature of the condensate leaving the radiator is not high enough to vaporize the fluid and, therefore, the valve remains open. This allows passage of condensate and air until steam begins to flow. The valves are very sensitive and will not blow steam when in proper adjustment and repair.

Connecting a ½ in. cold water line to the return main at the pump will condense any steam that may leak across the radiator vacuum valves due to improper closure because of dirt accumulating under the seat.

Pumps and receivers used for this type of service are usually designed to handle and remove approximatelv 0.3 to 0.7 cfm of air per 1000 sq ft of equivalent direct radiation. Larger air capacities are required for smaller systems and smaller capacities may be used for larger installations. When high vacuums are employed—above 5½ in. Hg—and/or air leakage is expected, greater air capacity should be specified. For greater vacuum, the pump should be furnished with a water sealed stuffing box. When operating at a given return line temperature, the maintained vacuum depends upon the ratio of air leakage rate into the system to the operating air capacity of the evacuator. For a given air leakage rate, the hotter the condensate returns, the lower the developed vacuum.

For high vacuum installations, it is essential to have the entire system tight to minimize air leakage and to prevent relatively high temperature steam from entering the vacuum return piping through leaky traps, high pressure drips, and other causes. For these reasons, condensate from equipment using high pressure steam should not be connected directly to



1 NOISE PROBLEMS in a vacuum heating pump may be solved using an arrangement like this. A 20 in. minimum distance between the receiver bottom and the boiler water level is the key to its success

READER ASKS —

"How Much Heat for Dry Kilns?"

"A plant making veneer crates for fruit has two dry kilns, each 7 × 22 × 120 ft. A total of 8000 wet crates are put through these each day and each crate contains about 8 lb of water. Banks of steam coils at one end with powerful exhaust fans at the other end furnish the present drying medium.

"The plant is shut down on Saturday, but the owners want to install auxiliary heat to make it possible to operate the kilns on that day.

"Can the necessary data as to the amount of heat required for this application be found or supplied? In my effort to locate a direct fired heater, I have estimated the heating load to be from 280,000 Btu per hr to 6,400,000 Btu per hr, but I feel that my answer needs checking."—H.W.H.

• *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

a vacuum return line, but instead be allowed to drain through a high pressure trap to a flash tank or a drip leg.

Reciprocating pumps are furnished with an air separating tank which is vented to the atmosphere. The tank is located on the discharge side of the pump at an elevation high enough to permit gravity flow of condensate to the boiler. If boiler pressure is too high for gravity feed, an additional pump is required for feeding water to the boiler. Use of a closed separating tank having a float controlled vent will eliminate need for the extra pump.

A recommended arrangement of equipment and piping for this type of application is shown in Fig. 1. A minimum distance of 20 in. between receiver bottom and boiler water level is required for low vacuum systems. As this distance is increased, better performance may be obtained. Return headers connecting vertical risers should be pitched towards the vacuum pump. If conditions do not allow continuous slope, lift fittings should be used as indicated.

I recommend that G.A.N. compare his piping arrangement with my suggestions and Fig. 1. Of particular importance are tight piping to avoid excessive air leakage and sufficient distance between receiver and boiler water level. Variation of heating load will induce similar changes of condensate flow rate and released air quantities. Unless sufficient hydrostatic head is available between receiver and boiler water level, noise will result due to pulsations. This phenomena is comparable to water hammer.

If the new location of the receiver is less than 20 in. above the water line, it is recommended that G.A.N. either raise the tank to a greater height or install a closed vessel having a float controlled vent.—H. B. WAYNE, Consulting Engineer. ⧺

WILLIAM A. BOUCHER —

Re-size Discharge Piping To Increase Head

FROM THE INFORMATION G.A.N. gives, the answer to his new disturbance lies in the loss of original head design in the discharge piping. When originally installed, the 160 ft of piping and the 8 ft of lost elevation was taken into account when establishing the discharge head of the pump.

The loss of head is equal to 160 ft of 2½ in. pipe, which at approximately 7.5 gpm equals 0.120 loss of head per 100 ft of pipe. For 160 ft of pipe this equals 0.192 ft of friction head. Loss of static head is 8 ft, making a total head loss of 8.192 ft. This figure does not include fittings that may have been eliminated by the change of piping.

If we multiply this loss in head by 0.433 to convert to pounds per square inch we arrive at 3.5 psig loss by the change in discharge piping. The pump racing and clattering at certain times would indicate that the pump discharge head is at the border line. At periods of maximum steam pressure fluctuations the discharge head is sufficient to keep the pump from speeding up. At periods of low steam pressure the loss of original head becomes apparent.

The best solution would be to resize the discharge piping in order to increase the discharge head. If a Hartford loop is employed the pump discharge may be dropped to the boiler return yoke. A possibility for temporary measures would be to increase the low limit of the pressure control. For a permanent installation it is preferable to decrease the size of the discharge piping and use up the available discharge head.—WILLIAM A. BOUCHER, Consulting Engineer. ⧺

• *In his question published earlier in HPAC, J. A. R. asked "How Can Overhead Pipes Be Used To Heat Plant?" A reply appeared on these pages in November. The following is another answer for the same problem.*

C. N. MATTIOLI —

"Heating by Overhead Pipes is Practice Abroad"

J. A. R.'s QUESTION struck home. In three years of practice in Paris as a heating design engineer I have had to parry just that type of heating suggestion several times, preferring solutions most commonly accepted back home in the U.S.A. But, here in France, heating workshops by overhead pipes is common.

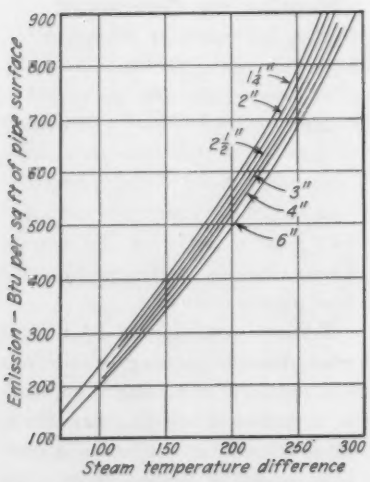
Perhaps surprising to J.A.R. and other American heating engineers is that this form of heating is not done as a method of utilizing waste heat. Quite the contrary. It is a most common means of heating shops from high temperature hot water distribution systems — as at Orly Airfield's maintenance shops here. I have seen

similar installations in airplane hangars, woodworking shops, metalworking shops, and warehouses.

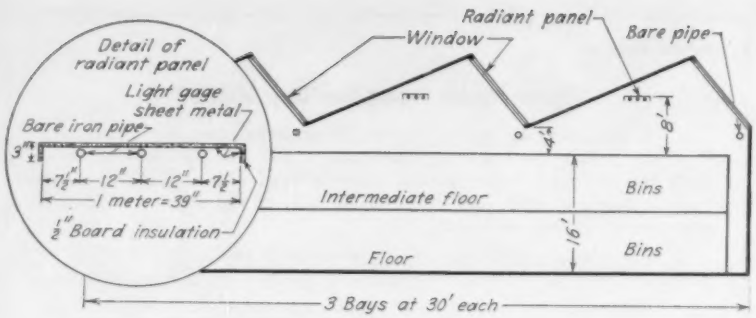
Theoretically, this overhead "radiant" heating system allows a large percentage of air infiltration into the shop without unduly discomforting the personnel. On some installations with large air infiltration rates, the common floor type unit heater at high discharge velocity is used at the source of infiltration — doors, for instance.

A chart for determining radiant heat transmission from bare horizontal pipes is Fig. 1. In the case of steam as a heating medium, the ordinate is the difference between steam temperature and room air temperature. Where high temperature hot water is used, the simple average temperature difference is used. Further refinement is hardly feasible because of the many job factors that can upset rigidly scientific calculations.

Once the emission factor has been determined, the following assumptions are made: that the heat radiation total be 70 percent of theoretical heat emission of bare pipe unobstructed; and that the downward radiation, including losses, be 70 percent of the emission. (This factor is somewhat conservative, but is frequently recommended.) It is sometimes assumed that some of the losses offset roof losses, and downdrafts.



1 TO DERIVE heat emission per sq ft of pipe surface, rates are plotted here for 1¼ to 6 in. pipes according to steam temperature differences



2 OVERHEAD PIPES provide heating for a storage warehouse in France using an arrangement like this. The inset shows how the panels are placed over the pipes to reflect heat downward

I recently used this method of heating for an active storage warehouse of an industrial plant here in France. The main storage area of this plant was divided into a floor storage area and a bin storage area. The latter was a two story affair covering some 20,000 sq ft.

With a sawtooth roof overhead, the problem was to get heat down the bin aisles without partiality and yet within practicality. Just by running a few transverse lines of overhead radiant heating, coupled with bare pipe at the base of the windows for stopping downdrafts, a very acceptable scheme was achieved. This arrangement is shown in Fig. 2.

In designing the system it was necessary to make the following calculations. With the steam temperature 300 F and the room air temperature 60 F, the difference was 240 F. Application of this quantity to Fig. 1 shows the emission of free pipe to be 780 Btu per hr per sq ft.

The total pipe emission was 70 percent of this, or 546 Btu per hr per sq ft. The useful radiation was again 70 percent of that, or 382 Btu per hr per sq ft.

For the problem in question the panel included three 1¼ in. pipes in a sheet metal container 39 in. wide. With the surface of 1¼ in. pipe being 0.44 sq ft per lineal ft, the panel useful output per foot of length was $3 \times 0.44 \times 382$, or 504 Btu per ft per hr per ft of length.

The panels should be hung low enough to permit accessibility of the piping by avoiding trusses and high over cranes. Installations of this type are common in hangars with panels more than 20 ft over the heads of personnel. In most installations I have seen, the panels are hung directly on the underside of trusses.

As long as steam or hot water above 250 F is available, the height of the panel presents no obstacle. HTHW installations often use supply temperatures of 300 F with return at 200 F. — C. N. MATTIOLI, Chief Mechanical Engineer, Ammann & Whitney, Engineers. ≠

Automation Necessary for Expanding Economy

. . . 'not a revolution'

"IF OUR STANDARD OF LIVING is to increase at its present rate, machines will have to be put to work where machines now do not exist," says Robert T. Sheen, 1956 president of the Instrument Society of America. In a speech before the Los Angeles Breakfast Club recently, he outlined the development and application of automation and its effect on our economy.

"It's an evolutionary process—not a second industrial revolution," he said. Advance in many industries have depended on it, and further use of automation is necessary to keep pace with market demands.

While automation has increased the output per worker, it has not reduced the number of jobs in industry, he pointed out, since our standard of living continues to rise. ≠

The Law and Your Profits

By William Hurd Hillyer

Don't Depend on General Contract

The subcontractor cannot rely for his protection upon the general contractor's agreement with the owner but must see that his own agreement with the general contractor sets forth a fair relationship

"TIME is of the essence." And for the mechanical (heating, piping, and air conditioning) subcontractor, loss of time may mean a loss of profit, as in a recent case. Wherever the word "time" appears in a subcontract, it is a danger signal, despite supposed protection by the general contract. All names herein are fictitious.

Major Corp. made an agreement wherein four general contractors undertook to construct and equip a large industrial building: No. 1 for the foundation, No. 2 for the structural steel work, and No. 3 for the installation of boilers. The fourth contract was let to Handyandi Bros., whose function was to do all required work that might not be included in the other three contracts.

Handyandi retained Metallik Co. as subcontractor under a written agreement that included sheet metal work, presumably for air conditioning and other units.

It was provided in the agreement that the job was to be done in accordance with plans and specifications of named architects and engineers. Copies of these were incorporated in the general contract between Major Corp. as owner and Handyandi Bros. as general contractors. The subcontract let by them to Metallik as subcontractor specified that the sheet metal concern was to receive $380,000, payable in monthly installments, for the work it undertook to do. This sum was admittedly paid.

Metallik claimed, however, that it had performed certain extra work at the request of and for the benefit of Handyandi and hence was entitled to additional compensation. The parties being unable to agree, subcontractor Metallik sued Handyandi, seeking recovery for alleged breach of contract. That firm's negligent slowness as general contractor, the metal company contended, caused delay in performance of the subcontract.

Metallik's claim for damages was based on the tie-up in the contract between owner and general contractor and between contractor and subcontractor. By virtue of these agreements, Metallik contended, it was the general contractor's duty "to organize the project, to provide proper supervision and coordinate the work of the various subcontractors, and to order and arrange for delivery of materials," so that the subcontract might be performed within a reasonable time.

Furthermore, Metallik averred that it was Handyandi's duty "to keep roadways leading to the job free from snow, ice and other obstructions, in order to permit delivery of materials and movements of personnel." Handyandi, according to Metallik, was required to provide electric current for temporary power and light, in such manner that Metallik's tools and equipment might be operated without interruption. None of these duties had the general contractor performed, the subcontractor alleged. The metal company also declared that because of delays resulting from such failures, its costs were increased and its profits curtailed.

Since the contract between Handyandi and Metallik did not specifically set forth the duties owed by the general contractor to the subcontractor, Metallik relied on the reference in that contract to the plans and specifications as contained in the general contract between Handyandi Bros. and the owner. By so doing, the sheet metal concern sought to read into its subcontract certain "general conditions" contained in the general contract. These set forth, among others, the following provisions:

"The work shall be carried to completion with the utmost speed . . . The [general] contractor shall prepare and submit [to owner] a definite progress schedule and shall execute all portions of the work in accordance with the approved schedule." In addition, "the general contractor shall furnish, install and maintain the electric service for temporary power and light . . . required for all the construction needs of the various trades operating under his contract and . . . under the trades assigned to him . . . General contractor shall . . . keep temporary construction roads free from snow, ice, or other obstructions for uninterrupted access to and from all buildings . . ."

The trial judge, after weighing

(*Continued on next page*)

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

both sides, ruled out consideration of these clauses in the general contract. He concluded that the following clause, in the contract-order between general contractor Handyandi and subcontractor Metallik was, as a matter of law, "decisive of the question at issue":

"*Time is the essence of this order.* Work to be done at such time or times and in such manner and in such quantities as may be required by us [Handyandi Bros.], to meet our time schedule."

Sustaining the lower court's decision in favor of defendant Handyandi, the state supreme court ruled on appeal that "the clause quoted can scarcely be given any interpretation other than as granting the defendant the right to direct and control the time and manner of doing work covered by the subcontractor." The higher court held that "the express terms of the agreement" between general contractor and subcontractor must control as against implications based on reference to the plan and specifications contained in the general contract . . . Such reference must be regarded as having been made for the purpose of identifying the work to be done," together with its extent, scope and purpose.

This decision means that the specific language of a contract between general contractor and subcontractor controls, as between these parties, notwithstanding any provisions of agreement between general contractor and owner. If, as in the present case, the subcontractor's contract specifies that his work is to be done according to the general contractor's time schedule, the subcontractor cannot recover damages from the general contractor because of delays, even though such subcontract made reference to plans and specifications in the contract between general contractor and owner requiring work to be completed with utmost speed.

In practice, this case teaches that the subcontractor cannot rely for his protection upon the general contractor's agreement with the owner, no matter how many clauses apparently favorable to subcontractors that document may contain. On the contrary, the subcontractor must see to it that his own agreement with the general contractor does not embody any nugatory or oppressive provisions and plainly sets forth what he regards as fair relationship between the general contractor and himself. ‡

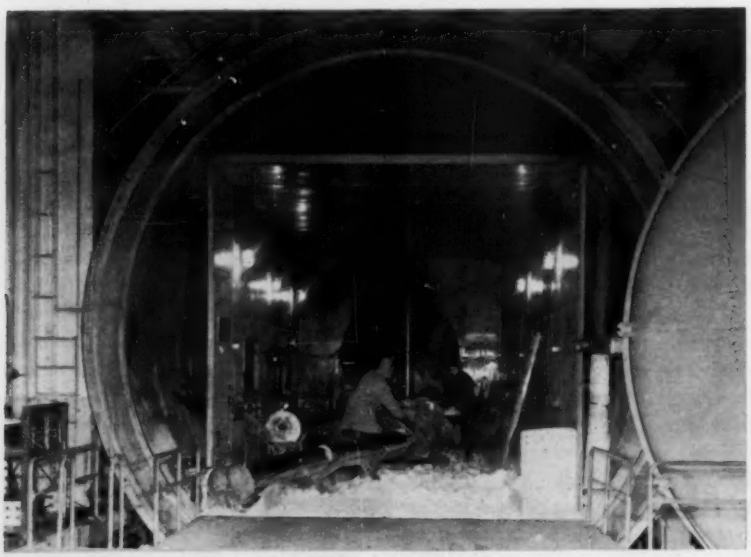
[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

Compile Data on Low Temperature Test Facilities

. . . to aid climatic testing

DATA on low temperature test chambers available in the U. S. has been compiled by Park W. Espenschade, of the Corps of Engineers Research and Development Laboratories. Information in the form of handbook characteristic sheets covers chamber measurements, temperature ranges, humidity and altitude provisions, auxiliary test equipment available, and other pertinent facts.

With operation in arctic and subarctic areas increasing in importance to the military and industry alike, this tabulated data of pre-field testing facilities afforded by both makes a unique contribution to climatic testing.

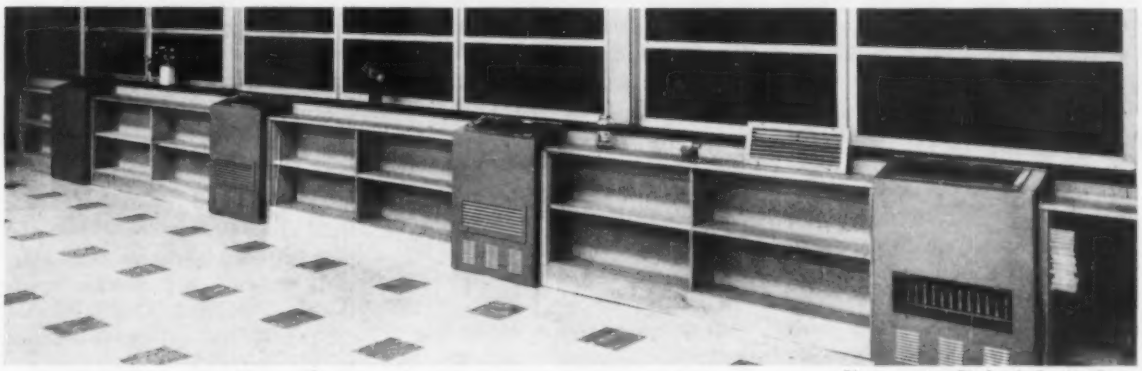


LOW TEMPERATURE TEST CHAMBER is used here to test an experimental ice and snow melter at the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va. Temperatures as low as −85 F can be maintained

Special emphasis for the Corps of Engineers is placed on chambers equipped for low temperature tests to −65 F of engine powered equipment. Augmenting the survey of physical characteristics, there are tabulated important provisions and human comfort aspects which must be considered in preparing and servicing engine powered equipment for low temperature tests, as well as the type of instrumentation desirable for most accurate results. Practical safety precautions are also listed.

Mr. Espenschade's analysis of key points in the situation, outlining preparatory steps, essential procedures, and facility utilization necessary to get the most out of low temperature tests, is aimed at providing some means of documenting anticipated performance on other than the "calculated risk" basis so frequently encountered. ‡

ELECTRIC UNIT VENTILATORS cut construction and maintenance costs at this new Indiana school. Permanent insulation of walls and roof minimize heat loss



Photos courtesy Pittsburgh Corning Corp.

Electric Unit Heaters Cut Cost of School

By T. A. McConnaughey
Architect

ECONOMY dictated the use of electric heating equipment in the new Parkside grade school in Hartford City, Ind. A saving of $50,000 on the $330,000 school was obtained by eliminating the boiler room, conventional pipe trench and stack, by reduced maintenance, and by a lower insurance rating. And although the estimated cost of operation will be $2200 compared to $1600 for other fuels, the cost actually is lower when other factors such as operating personnel are considered.

Built of steel, concrete block, face brick, and glass, the school, when completed, will be L-shaped and will accommodate 400 students. One wing, 218 x 69 ft, was ready for use in September, 1955. Construction on the second wing, 167 by 69 ft, will be started in 1956.

The single story school building will have a total of 12 classrooms, a large kindergarten room, a cafeteria, a library, and an all purpose room.

The roof is exposed beams, 3 in. tectum, 2 in. cellular glass, and built-up composition. The floor is concrete slab over gravel, with rubber tile.

The calculated heat loss at design conditions is 870,000 Btu per hr, including the required ventilation air. The glass area for a classroom is 96 sq ft, with 144 sq ft of glass block.

The school will be all electric, including heating, water heating, cafeteria equipment, incinerator, and soil heating cables in the floor of the kindergarten room.

An electric heater-ventilator unit was designed especially for this school. Each of the 12 classrooms will be heated by four thermostatically controlled electric heaters supplying warmed air from the outside through ducts built into the heaters and extending through the outside walls to 5 by 15 in. outdoor air intake grilles. The heaters have a 3.5 kw, 208 volt, single phase rating.

Power for heating will be supplied by the Indiana-Michigan Electric Co. at the rate of $0.02 per kw hr.

Outdoor air is taken directly into each room at the rate of 332 cfm. This is 11.4 cfm per student and was designed on a minimum requirement of 10 cfm per student. This corresponds to about two complete air changes per hour in each of the 12 classrooms.

The heaters are beneath the windows. Room air exhaust vents are on the opposite walls, terminating in a plenum over the center corridor. One roof ventilator will be used in each wing of the building.

One of the outstanding factors of this heating system is the positive ventilation, which is time clock controlled. It is almost impossible to obstruct the flow of ventilation air to the classrooms.

The time clock control system is also extended to the heating units and roof ventilator. The units will start operating at a predetermined time in the morning and will be shut off at the end of the school day, causing the room air temperature during the unoccupied hours to be reduced. The operation is automatic.

To make such a heating and ventilating system practical, walls and roof of the building are permanently insulated against heat loss by 2 in. rigid cellular glass. ≠

How To Install PVC Plastic Pipe

Polyvinyl chloride plastic pipe, being rigid, can be installed overhead with pipe supports or underground. Fittings are attached by any of four methods: solvent cementing, threading, heat welding, and adhesives.

RIGID POLYVINYL CHLORIDE plastic pipe is available in two types: normal impact and high impact. Installation procedures for the two are the same, with but a few exceptions.

The normal impact type, which can be used at temperatures up to 150 F and at higher working pressures than can the high impact type, is also more resistant to chemicals. However, the high impact type, although with less strength, temperature resistance, and chemical resistance, has greater impact strength over an extended temperature range. It is recommended where rough handling during transportation and installation is expected and where the properties of the normal impact type are not critical.

How Plastic Fittings Are Joined

Fittings for polyvinyl chloride pipe are manufactured by injection or transfer molding. In these processes the polyvinyl chloride is plasticized, either by heating or by a combination of heating and mechanical working, and is then forced into a mold of the desired shape. Fittings are manufactured in all the usual steel pipe types and some that are peculiar to plastic construction. Both the normal impact and high impact resin types are available.

Piping systems fabricated from polyvinyl chloride throughout are possible, since such components as valves, pumps, exhaust blowers, and flange fittings, as well as such fittings as tees, ells, couplings, unions, and bushings, are now being produced from polyvinyl chloride. Pipe and fittings are either threaded, or made with a smooth cavity for joining by solvent cementing, heat welding, or through the use of adhesives.

When Schedule 40 pipe is used, slip fittings should be specified, since it is not advisable to thread Schedule 40 pipe. The fitting should be of the same PVC type as the pipe in order that the chemical and physical properties will be the same in all the components of the pipe line.

The best method of joining depends on the service requirements of the installation.

If it is necessary to cut the pipe, this may be readily accomplished with a rotary saw, lathe, or hacksaw. It is desirable to obtain a square cut, especially when threaded joints are required. A mitre box should be used when a hand hacksaw is used for cutting. When it is necesary to chuck or clamp the pipe, some method should be used to prevent nicks and scratches, such as wrapping the pipe in canvas or emery paper.

Solvent Cementing Is Fastest

In joining polyvinyl chloride pipe by solvent cementing, the end of the pipe and the fitting socket are first cleaned with a suitable solvent, such as carbon tetrachloride. The solvent is allowed to evaporate, and then both the pipe and the socket are quickly coated with a thin layer of the solvent cement. The pipe and fitting should be engaged as soon as possible and either the pipe or the fitting rotated 90 deg to dispel air and improve the surface contact. An appropriate setup time, which depends on the type of solvent cement used, is necessary for the joint to attain full strength. In general, however, the initial strength of the joint with the fit of the pipe and fitting will allow continuous installation of pipe lines.

Several cements suitable for joining polyvinyl chloride pipe are available. Various conditions of installation may require the use of different cements, depending largely on the temperature conditions under which the pipe is to be installed. Information regarding the use of these cements may be obtained from fitting makers.

Thread with Standard Machines

Schedule 80 polyvinyl chloride pipe can be threaded by using standard metal thread cutting tools, either machine or hand operated. The material is easily threaded without the use of external lubricants. Since polyvinyl chloride is somewhat notch sensitive—predisposed to failure in the area of stress raisers, as are most of the materials of construction—threading is not recommended for joining Schedule 40 pipe, where the thread grooves would be too deep for the relatively thin wall.

Threading dies should be maintained in good condition to produce sharp, clean threads. Since poylvinyl chloride is relatively flexible as compared to metals, it is advisable to insert a tapered plug into the end of the pipe to hold the pipe round as it is being threaded. This results in threads of uniform depth circumferentially. In order to insure a tight, leakproof fit, the thread dimensions on page 113 should be used. It is important to follow recommendations concerning the thread length, for if the threaded portion is too long, it is impossible to run the fitting on far enough to obtain a good seal.

Joints can be effectively sealed with the standard thread compounds, depending on the medium to be carried. For extreme chemically resistant applications, a thread compound based on the tetrafluoroethylene resins should be used. This compound acts as a lubricant, as well as a chemically resistant seal. The fitting should be started carefully and screwed on as tightly as possible by hand. Further tightening should be done with the use of strap wrenches. Standard pipe wrenches cannot be used since

Material in this and the two following articles courtesy of National Tube Div., United States Steel Corp.

they deform and scar the pipe, thus weakening it.

Train Plastic Welders

Poylvinyl chloride pipe and fittings can be effectively joined by heat welding by operators skilled in the technique. Heated gas guns and filler rods are utilized in order to form welds in a manner similar to that used in welding metals. Rods and welding equipment are manufactured by a number of concerns. Welding schools are maintained by several organizations where operators may become competent plastic welders.

Adhesives Are Solvent Cements

There are a number of adhesives available which have epoxy or phenolic bases. These may be utilized in the same manner as solvent cements.

For installations where polyvinyl chloride pipe is joined to metal pipe, a flexible adhesive should be used to prevent leakage due to differences in thermal expansion.

Limit Bending PVC Pipe

Bending may sometimes be utilized advantageously in fabricating polyvinyl chloride pipe lines. However, bending should be limited to use in only those noncritical applications at room temperature or lower where maximum operating pressures are not utilized.

With the procedure normally used in bending, some stresses from bending are retained in the material, which are additions with respect to those caused by the pressure of the medium.

Prior to bending, the pipe should be heated at the section to be bent to a temperature of about 275 F by means of hot air or immersion in a liquid. Care should be taken to avoid overheating or holding the pipe at the bending temperature too long, since the pipe may lose its form. After the section has been heated uniformly, the pipe may be bent to a minimum radius of 10 times the pipe diameter. It is advisable to use pipe bending forms to prevent flattening. The radius of bend should be slightly less than the desired radius since there is a small amount of springback. The pipe may be cooled quickly after forming.

How To Space Supports

Supports for polyvinyl chloride pipe should be spaced at intervals one-third to one-fourth the length of those used for steel pipe. Saddle type hangers are generally suitable. When threaded fittings are utilized in a system which undergoes large thermal fluctuations, stresses at the fittings from thermal contractions or expansions can be avoided by clamping the pipe tightly on both sides of the fitting, thus restricting deflections at the fitting. This is especially important at 90 deg turns, since bending stresses are imposed in the pipe at the threaded portion by thermal contractions or expansions if the pipe is allowed to move freely.

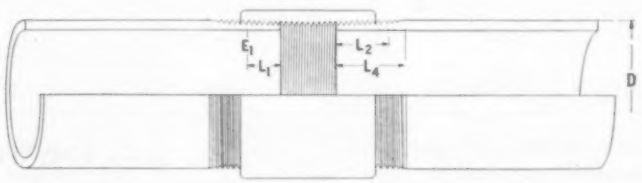
As the operating temperature is increased, it is necessary to decrease the support spacing. Pipe insulation, due to its weight, also necessitates closer spacing. Consideration should be given to continuous support for insulated lines operating at high temperature.

How To Install Underground

In applications where underground installation is required, care should be exercised so that the pipe is not damaged in the laying operation. Ditches should be smooth and regular, so that localized bending stresses are not imposed. The pipe should be laid below the frost line if water is to be conveyed, since the pipe may fail due to expansion of the water if it freezes.

In backfilling, a layer of loose material, free from rocks, should be placed to at least a height of 6 in. above the top of the pipe. This acts as a cushion to prevent breakage.

High impact polyvinyl chloride plastic pipe is best suited for most underground applications. However, for those applications which require higher working pressures, higher operating temperatures, or better chemical resistance, normal impact polyvinyl chloride plastic pipe may be utilized, provided a reasonable amount of care is exercised in the handling and laying operations. ≠



AMERICAN STANDARD THREAD DIMENSIONS

PIPE		THREADS				
Size: nominal	Outside diameter	Number per inch	Length: end of pipe to handtight plane	Effective length	Total length: end of pipe to vanish point	Pitch diameter at handtight plane
	D		L_1	L_2	L_4	E_1
Ins.			Ins.			
½	.840	14	.320	.5337	.7815	.77843
¾	1.050	14	.339	.5457	.7935	.98887
1	1.315	11½	.400	.6828	.9845	1.23863
1¼	1.660	11½	.420	.7068	1.0085	1.58338
1½	1.900	11½	.420	.7235	1.0252	1.82234
2	2.375	11½	.436	.7565	1.0582	2.29627
3	3.500	8	.766	1.2000	1.6337	3.36850
4	4.500	8	.844	1.3000	1.7337	4.38713
6	6.625	8	.958	1.5125	1.9462	6.50597

THREAD DIMENSIONS shown here should be used to obtain a tight, leakproof fit. Threading is recommended for Schedule 80 PVC pipe only; grooves would be too deep for the relatively thin wall of Schedule 40 PVC

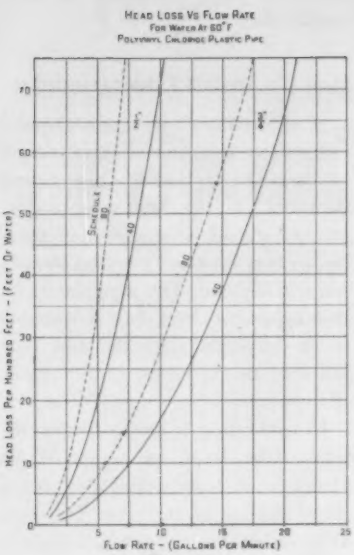

HEAD LOSS VS FLOW RATE
FOR WATER AT 60° F
POLYVINYL CHLORIDE PLASTIC PIPE
HEAD LOSS PER HUNDRED FEET – (FEET OF WATER)
FLOW RATE – (GALLONS PER MINUTE)
SCHEDULE
80
40

Fig. 1

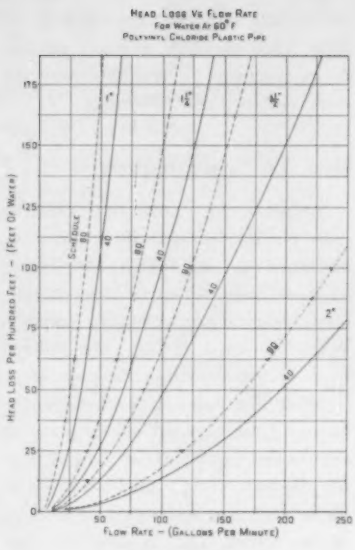

HEAD LOSS VS FLOW RATE
FOR WATER AT 60° F
POLYVINYL CHLORIDE PLASTIC PIPE
HEAD LOSS PER HUNDRED FEET – (FEET OF WATER)
FLOW RATE – (GALLONS PER MINUTE)
SCHEDULE
80
40

Fig. 2

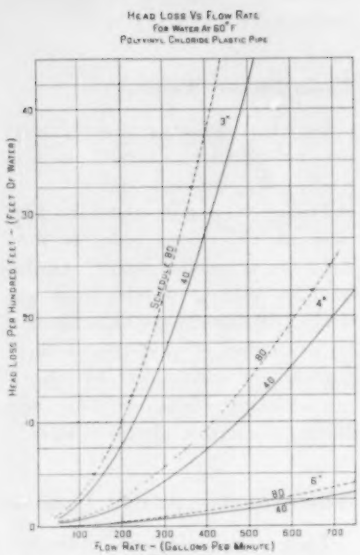

HEAD LOSS VS FLOW RATE
FOR WATER AT 60° F
POLYVINYL CHLORIDE PLASTIC PIPE
HEAD LOSS PER HUNDRED FEET – (FEET OF WATER)
FLOW RATE – (GALLONS PER MINUTE)
SCHEDULE 80
40

Fig. 3

FLOW OF WATER through polyvinyl chloride plastic pipe at a given pressure — or the pressure required to maintain a certain flow rate — may be determined from these charts showing conditions at 60 F

How To Design PVC Plastic Pipe Lines Economically

. . . for transporting water

THE FLOW CHARTS on this page have been prepared to assist in the design of polyvinyl chloride plastic pipe lines. For a given flow rate or pressure drop, the most economical pipe size and schedule may be chosen through the use of these charts. In computing the internal pressure for a specified flow rate, changes in static head and head loss due to restrictions—valves, orifices, etc.—as well as flow head loss must be considered. Head loss expressed in feet of water may be converted to psi by multiplying by 0.433.

Example 1:

To find the maximum discharge of water from a Schedule 40, 2 in. pipe line 2500 ft long at a maximum operating pressure of the pipe when the discharge elevation is 50 ft higher than the source of supply:

From Fig. 1 on page 115, maximum operating pressure, Schedule 40, 2 in. pipe = 195 psi.

To convert 195 psi to feet of water:

195 psi/0.433 = 450.3 ft

450 allowed ft of water less 50 ft elevation = 400 ft of water allowed to meet pipe pressure specification.

To find allowable head loss per 100 ft, divide the allowed overhead loss in line by the number of 100 ft multiples in the line:

400/25 = 16

Then, reading chart of Fig. 1 above, a line at 16 ft of water on Schedule 40, 2 in. pipe shows a flow rate of approximately 120 gpm.

Example 2:

To find the pressure required to supply 100 gpm a distance of 1500 ft, using Schedule 40, 2 in. pipe:

From Fig. 2 above, a flow of 100 gpm results in a head loss of 13 ft of water per 100 ft of pipe. Thus:

(13)(1500)/100 = 195 ft

To convert to the required psi:

(195)(0.433) = 84.4

Determining Maximum Operating Pressure Of PVC Plastic Pipe at Any Temperature

FOR NORMAL IMPACT TYPE PIPE

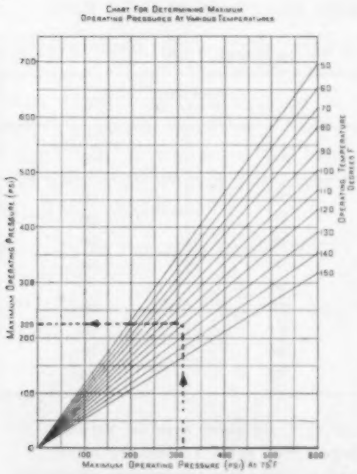
SINCE the strength of normal impact polyvinyl chloride decreases as the operating temperature is increased, it is necessary to decrease the allowable working pressures at higher temperatures. Working pressures at 75 F are approximately 20 percent of the burst pressures. When operating temperatures exceed 75 F, the maximum operating pressure should be determined from Fig. 1.

To determine the maximum operating pressure at any temperature, the maximum operating pressure at 75 F must first be determined from Table 1. This value has been plotted against the maximum operating pressure for temperatures between 50 F and 150 F. The maximum operating pressure is found by starting at the lower scale with the value of the maximum operating pressure at 75 F, plotting to the line corresponding to the operating temperature and then to the vertical scale.

Example:

In order to determine the maximum operating pressure at 120 F, for normal impact polyvinyl chloride 1 in. standard pipe, the maximum operating pressure at 75 F, is first determined from Table 1 below. This is found to be 310 psi. Starting at this value along the lower scale in Fig. 1, and plotting to the line for 120 F, and then to the vertical scale, the maximum operating pressure at 120 F is found to be 225 psi. This example is illustrated by the dotted lines in Fig 1.

Fig. 1



TEMPERATURE-PRESSURE CHART for normal impact PVC pipe gives maximum operating pressures at various temperatures. Dotted line shows pressure for 1 in. pipe at 120 F

TABLE 1—NORMAL IMPACT POLYVINYL CHLORIDE PLASTIC PIPE

Nominal Size (Ins.)	Maximum Operating Pressures at 75°F.		
	Standard (Schedule 40) Plain End (Psi)	Extra Strong (Schedule 80)	
		Plain End (Psi)	Threaded (Psi)
½	410	575	330
¾	335	470	285
1	310	435	255
1¼	255	360	220
1½	230	325	205
2	195	280	190
3	185	260	170
4	155	225	160
6	125	195	150

MAXIMUM OPERATING PRESSURES at 75 F are given here for various diameters of Schedules 40 and 80 normal impact PVC pipe. To find the maximum operating pressure of a given size and schedule at a temperature other than 75 F, first find the pressure at 75 F in Table 1. Then, in Fig. 1, from this pressure read up to the temperature line, and from the intersection read left to the maximum operating pressure at that temperature

HPAC DATA SHEET

Maximum Operating Pressure

FOR HIGH IMPACT TYPE PIPE

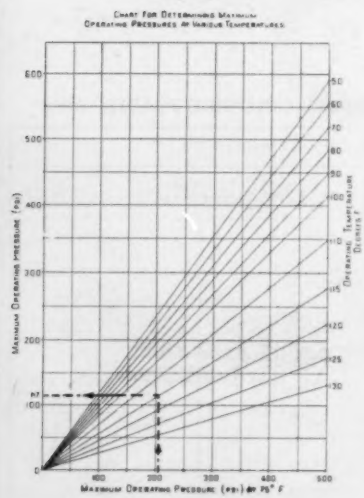
Maximum operating pressures for various temperatures may be readily determined for high impact polyvinyl chloride from Fig. 2. At 75 F the maximum operating pressures are approximately 20 percent of the burst pressure. The maximum operating pressures are decreased with increased temperature in a manner similar to that for normal impact polyvinyl chloride up to 110 F. Above 110 F creep extension—a time dependent extension which occurs at stresses lower than yield strength—becomes significant, so that the pressure rating chart must be based on the creep characteristics of the material in the range of temperature from 110 F to 130 F.

Maximum operating pressures for various temperatures are determined in the following manner. First, the maximum operating pressure at 75 F is determined from Table 2. Starting at this value on the lower scale of Fig. 2, plot to the line for the operating temperature and then to the vertical scale where the value of the maximum operating pressure may be read.

Example:

To determine the maximum operating pressure for high impact polyvinyl chloride 1½ in. standard pipe at a temperature of 115 F, it is necessary to find the maximum operating pressure at 75 F in Table 2. This value is 210 psi. Starting at 210 psi on the lower scale in Fig. 2, and plotting to the line for 115 F, and then to the vertical scale, the maximum operating pressure at 115 F is found to be 117 psi. The dotted lines in Fig. 2 indicate this procedure. ±

Fig. 2



TEMPERATURE-PRESSURE CHART for high impact PVC pipe indicates lower maximum operating pressures for high impact than are possible for normal impact. See Fig. 1

TABLE 2—HIGH IMPACT POLYVINYL CHLORIDE PLASTIC PIPE

Nominal Size (Ins.)	Maximum Operating Pressures at 75°F.		
	Standard (Schedule 40) Plain End (Psi)	Extra Strong (Schedule 80)	
		Plain End (Psi)	Threaded (Psi)
½	335	470	270
¾	275	385	230
1	255	355	205
1¼	210	295	180
1½	190	285	170
2	160	230	155
3	150	215	140
4	130	185	130
6	105	160	125

MAXIMUM OPERATING PRESSURES at 75 F are given here for various diameters of Schedules 40 and 80 high impact PVC pipe. To find the maximum operating pressure of a given size and schedule at a temperature other than 75 F, first find the pressure at 75 F in Table 2. Then, in Fig. 2, from this pressure read up to the temperature line, and from the intersection read left to the maximum operating pressure at that temperature

HEATING, PIPING & AIR CONDITIONING
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Journal Section

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Branch Fitting Performance at High Velocity

By C. M. Ashley, S. F. Gilman** and R. A. Church†, Syracuse, N. Y.*

SUMMARY — Critical examination of the usual method of correlating static regain test data shows that regain coefficient values above 1.0 are possible. Confirmation is obtained through analytical relationships developed by the authors for particular flow conditions and also by original experimental data.

Results of pressure loss tests of branch takeoffs are presented and correlated with work of previous investigators. The conical type of takeoff is found to be considerably more efficient than the cylindrical type.

A static regain chart for main ducts and pressure loss curves for conical takeoffs are presented in forms usable by application engineers.

THE PRESENT trend of using higher velocities in air duct systems emphasizes the need for more accurate design data encompassing a greater range of velocities. Over the past few years, considerable data have been collected from laboratory tests of ducts and fittings with velocities up to 4500 fpm. This paper presents an analysis, test results and conclusions based upon laboratory tests of a fitting type of great practical importance — the divided-flow fitting typified by the diagram in Fig. 1. Pressure losses both in the straight-through section of the constant area main and in the branch takeoff are considered.

Analysis of Straight-Through Section

Currently available data for the straight-through section were compared in a recent paper[1] and the need for further research indicated. The lack of agreement between results of different investigators is clearly demonstrated in Fig. 1. Since the size and shape of the main is constant, the flow-rate ratio Q_D/Q_U can also be interpreted as the velocity ratio V_D/V_U. The ordinate is the dimensionless *regain coefficient*, which is the ratio of the static pressure rise to the decrease in velocity pressure based upon the mean velocity of flow. In equation form,

$$R = \Delta(SP)/\Delta(VP) \quad \ldots\ldots(1)$$

In units of feet of fluid flowing, the loss of total head in the main duct is therefore

$$H = (1 - R)[(V_U^2 - V_D^2)/2g] \quad \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Curve A, Fig. 1, is the basis of the present static regain chart[2]. Curve B was obtained from the Carnot-Borda equation for abrupt expansion; namely,

$$H_e = (V_U - V_D)^2/2g \quad \ldots\ldots(3)$$

Equating 2 and 3,

$$R = 1 - (V_U - V_D)/(V_U + V_D) \quad \ldots\ldots\ldots\ldots\ldots\ldots(4)$$

which can be written

$$R = (2Q_D/Q_U)/(1 + Q_D/Q_U) \quad \ldots\ldots\ldots\ldots\ldots\ldots(5)$$

This is the function shown as Curve B in Fig. 1. Curve C has been taken from the publication of Konzo[3] and has its origin in a thesis[4]. Curve D was suggested in a recent ASHAE paper[1]. The great diversity in results of different investigators is clearly evident. It is significant that at the higher flow rate ratios, Curves A and C predict much poorer performance than the Carnot-Borda Equation.

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[1]Exponent numerals refer to References.

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Journal Section

Although Curve C looks radically different from the others, the decreasing values of R at flow-rate ratios above 0.8 have a possible explanation. As developed in the Appendix, the loss can be expressed in terms of upstream velocity heads. Results are shown in Fig. 2. For Q_D/Q_U values above 0.8 it is seen that the Curve C regain coefficients are equivalent to upstream velocity head losses (values of λ_U) of the order of 0.05 or less. Since these tests were conducted with low velocities representative of residential practice, the extremely small pressures involved are very difficult to measure. Hence, a slight discrepancy in this range will have considerable influence on the value of R. However, the net pressure loss is so small that considerable deviation between curves at the upper end are not of serious consequence from a practical standpoint.

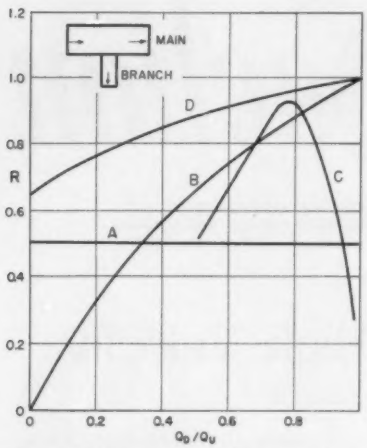

Fig. 1—Regain coefficient data from four sources

As a general consideration of the Fig. 1 curves, from fluid dynamics principles the Carnot-Borda loss given by Curve B should represent the *lower* limit of R. Consequently, laboratory results should ordinarily be expected to fall above this curve.

Determination of the *upper* limiting curve of R values requires detailed analysis. For a one-dimensional frictionless flow, the Bernoulli equation applies and the upper limiting curve is given by $R = 1.0$. For a real fluid, the total head varies from one stream filament to the next because of the distribution of velocity across the section. For the actual case, therefore, it is necessary to determine the upper limiting curve by analyzing a representative flow pattern. Such a pattern is given by the Prandtl Seventh-root Law of velocity distribution[5].

$$v = v_{max}(y/r)^{1/7} \quad \ldots\ldots\ldots(6)$$

This relationship is shown in Fig. 3 with the mean velocity V as reference. The distribution of kinetic energy per unit mass across the section is also shown. Near the pipe axis the mean kinetic energy is considerably greater than the kinetic energy of the mean flow (value of 1.0); whereas, near the wall the converse is true. Also, as developed in the Appendix, the total kinetic energy for this velocity pattern is 6 percent greater than that corresponding to the mean velocity of flow. If a type of branch takeoff that removes the flow nearest the pipe wall is visualized, then the flow having the highest kinetic energy continues down the main. As a consequence, more energy than credited with will be available in the straight-through section for conversion to static pressure.

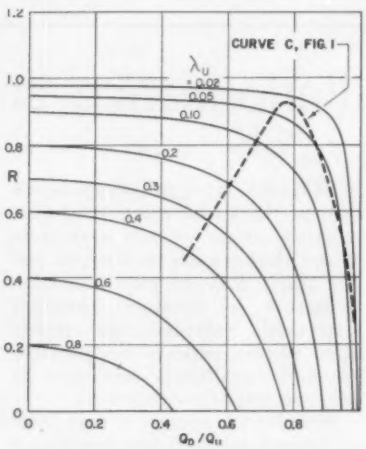

Fig. 2—Relationship between regain coefficient, R, and loss in upstream velocity heads, λ_U

When laboratory tests with air ducts are conducted, regain coefficients are conventionally obtained by dividing the measured static pressure rise by the decrease in velocity pressure as computed from the *mean velocities of flow*. Thus, for air of standard density and velocity units of fpm, Equation 1 is used in the form

$$R = [(SP)_D - (SP)_U]/[(V_U/4005)^2 - (V_D/4005)^2] \quad \ldots\ldots\ldots(7)$$

Since the numerator is *measured* and the denominator *computed*, excess energy at Section D appears in the numerator as an additional pressure rise which is not accounted for in the denominator. The regain coefficient can therefore be greater than 1.0; *i.e.*, the regain efficiency can be greater than 100 percent. It should be emphasized that R values exceeding unity do not violate the conservation of energy law. Such values occur only because Equation 7 does not account for the non-uniform distribution of kinetic energy across the pipe section.

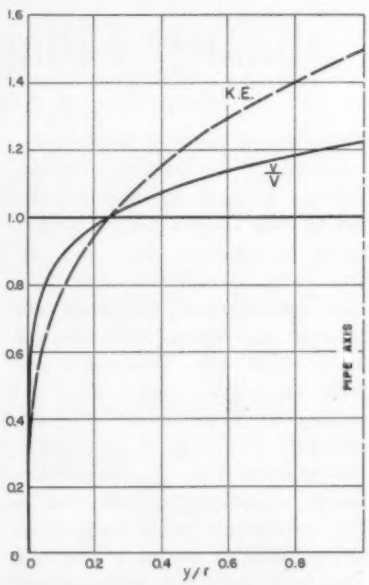

Fig. 3—Distribution of velocity and kinetic energy with a seventh-root profile

To obtain a curve of maximum attainable R values, the flow con-

figuration of Fig. 4 will be analyzed under somewhat idealized and simplified conditions. Presume the flow into the branch is taken from the periphery of the pipe, as indicated by the flow boundary line, so that the Section 2 flow continues along

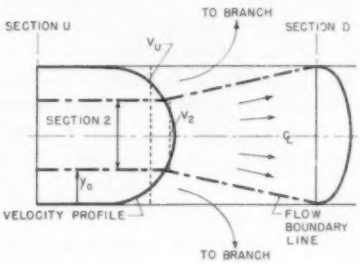

Fig. 4—Flow configuration analyzed

the main. Also, presume the velocity pressure corresponding to the mean velocity of the Section 2 flow is conserved and therefore converted to static pressure at Section D. Under these conditions, the relationship between regain coefficient and flow-rate ratio can be determined analytically. The development is given in the Appendix. With a seventh-root profile at Section U, the result is

$$R = \{[1/(1 - x_o)^4] - 1\} (Q_D/Q_U)^2/[1 - (Q_D/Q_U)^2] \quad \ldots\ldots\ldots\ldots (8)$$

in which

$$Q_D/Q_U = 1 + (8/7)\, x_o^{10/7} - (15/7)\, x_o^{8/7} \quad \ldots\ldots\ldots (9)$$
$$0 \leq x_o \leq 1$$

Curve E of Fig. 5 applies to one-dimensional, frictionless flow and has the constant value unity. Curve F represents Equation 8, and it is to be noted that R is always greater than 1.0. The curve therefore confirms the foregoing reasoning that regain efficiencies above 100 percent are physically possible.

Equation 6 applies for Reynolds numbers up to about 50,000. Values considerably in excess of this are often attained in high velocity duct systems. For the highest velocities and largest ducts, velocity profiles are better represented by the tenth-root relationship[5]

$$v = v_{max}\ (y/r)^{1/10} \quad \ldots\ldots (10)$$

The resulting function is shown by Curve G of Fig. 5, and its equation is given in the Appendix. Although the shape of G is similar to F, the

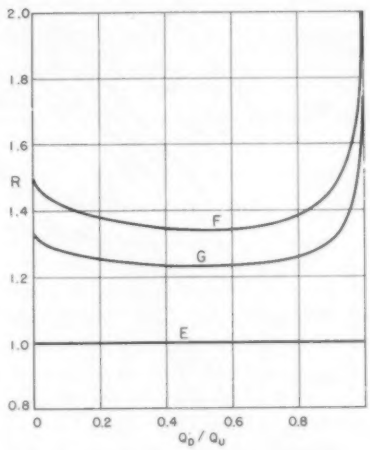

Fig. 5—Results obtained analytically

R values at corresponding flow-rate ratios are less. This would be anticipated because a tenth-root profile is flatter than a seventh-root profile and, as a consequence, the kinetic energy is more uniformly distributed over the pipe cross section. Note that if the exponent on y/r in Equation 10 is decreased to zero, the one-dimensional case (Curve E) is obtained.

The preceding analysis and curves show that, when computing test results by Equation 7, static pressure regain efficiencies above 100 percent are physically possible without violating the conservation of energy.

Comparison with Test Results

Results of laboratory tests with a 3-in. diameter branch duct connected to an 8-in. diameter main are shown by the circles and Curve H in Fig. 6. Following conventional laboratory practice[1], the regain coefficient was computed from Equation 7 with the measured pressures corrected for friction losses between the junction and the upstream and downstream measuring stations.

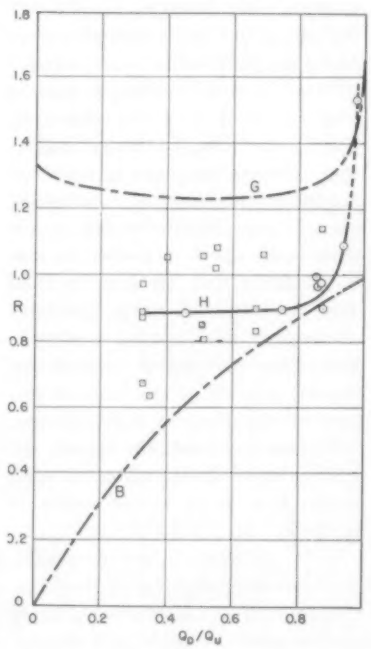

Fig. 6—Comparison of analytical and experimental results

Curve G is included for comparison and it is notable that the curve representing experimental data follows the same trend, and also that values of R above 1.0 are obtained from test data. The squares are results from tests with other divided-flow fittings of various area ratios and designs. Since each design was studied over a narrow range of flow-rate ratios, no attempt has been made to fit curves to the results. Their primary purpose is to show that R values

Symbols

A = area.
d = differential of a function.
H = loss of head, ft of fluid flowing.
R = regain coefficient defined by Equation 7, dimensionless.
(SP) = static pressure, inches of water.
(VP) = velocity pressure, inches of water.
Q = volume rate of flow.
r = radius of pipe.
y = radial distance from pipe wall.
y_o = radial distance from pipe wall to flow boundary line (see Fig. 4).
x = dimensionless radius, y/r.
x_o = dimensionless parameter, y_o/r.
v = velocity.
V = mean velocity over a cross section, Q/A.
λ = loss coefficient (pressure loss divided by a reference velocity pressure), dimensionless.
ρ = mass density, slugs per cubic foot.

Subscripts:

U = upstream cross section of main duct.
D = downstream cross section of main duct.
B = branch duct cross section.
e = Carnot-Borda loss.
max = maximum.

above 1.0 were also obtained with other fitting designs. Curve B represents the Carnot-Borda expansion loss and has been transposed from Fig. 1; this curve should represent the lower limit of data collected.

Study of Equation 7 will show that as $Q_D/Q_U = 1.0$ is closely approached the value of R will be sensitive to very slight inaccuracies in laboratory measurements. Therefore, the last plotted point on Curve H is not considered firmly established, and the curve has been drawn as a broken line. No great difficulty is introduced, however, because values of Q_D/Q_U above 0.95 rarely occur in the design of air duct systems.

There are two principal reasons why Curve H is below Curve G. The former includes energy dissipation, whereas the latter is based on essentially no loss of mechanical energy. Secondly, the actual branch duct, being simply butted to the side of the main, does not draw its fluid from the entire low energy periphery of the main flow. Instead, it takes its flow from the region around the branch opening so that only a portion of the flow of lowest kinetic energy is drawn into the branch, the remainder being taken from the high energy flow in the central region of the pipe.

From the analysis and test results, it is concluded that Curve H of Fig. 6 is rational and is representative of performance attainable with conventional divided-flow fittings when utilized for medium and high velocity applications.

Application Considerations

Main ducts of high velocity systems in commercial buildings frequently have several branch ducts connected at various intervals. Also, the branch ducts are frequently of the same size and resistance and have the same design flow rate. Any unbalance in the system is primarily the result of the friction pressure loss in the main duct between takeoffs. It is, therefore, very desirable that the flow having the highest energy be available in the straight-through section for overcoming this friction loss. The characteristic indicated by Curve H is therefore advantageous from the design standpoint. Moreover, a fitting design which closely approached the Curve G performance would tend to minimize system unbalance in most applications.

Since mean velocities and static pressure are conventionally used as a basis for system design, Curve H has been used to formulate the static regain chart of Fig. 7. With design velocities V_U and V_D, the chart yields values of the increase in static pressure between Sections U and D. Comparison of values with those in the literature[2] show that much more static pressure is available downstream of the takeoff than heretofore presumed. The marked increase in effectiveness is seen by comparing Curve H with the present regain basis of $R = 0.5$ in Curve A. The resultant increase in available pressure is also in agreement with field tests in which static pressures toward the ends of main ducts have been found to be higher than anticipated. This new chart is considered to contain much more realistic and authoritative design information. It is hoped the chart will contribute to the improvement of air duct design methods, particularly for high velocity systems which are becoming increasingly numerous.

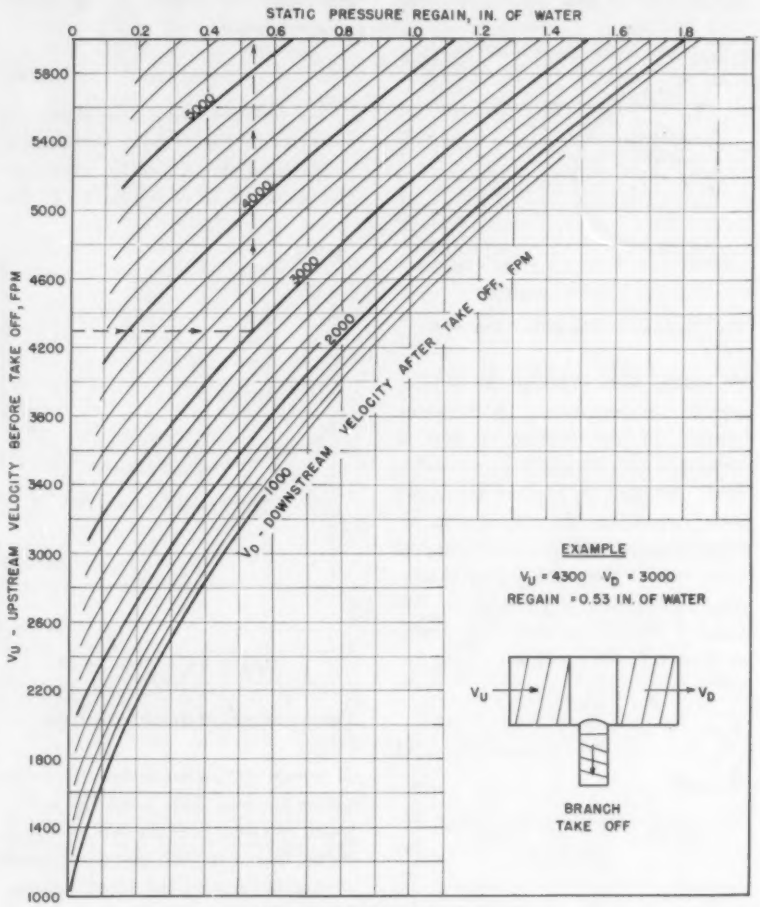

Fig. 7—Static regain chart

The size of the main duct is frequently reduced after a branch takeoff, and it is desirable to know the static pressure in the smaller duct. The reducing fitting connecting the ducts usually has an included angle of 45 to 60 deg, and the pressure loss is very small. A representative

value is 5 percent of the velocity head in the smaller duct[6], which is approximately 3 equivalent diameters.

The principal factor is the conversion of static pressure to velocity pressure as the flow accelerates. The static pressure will decrease by the difference in velocity pressures after and before the transition. A chart is available for determining velocity pressures from known values of mean velocity[2]. The static pressure at the beginning of the smaller duct can be found by *adding* the amount of regain from Fig. 7 to the static pressure at Section U and *deducting* the change due to energy conversion.

Diverted-Flow Section

As pointed out recently[1], the pressure loss in the branch takeoff must be considered separately from that in the straight-through section. Concerning the flow diverted into the branch, test results are ordinarily expressed in terms of a dimensionless loss coefficient λ_B. This coefficient is the loss in total pressure divided by the velocity pressure corresponding to the mean velocity of the branch flow[1]. Test results for two takeoffs of the conventional type are presented in Fig. 8 and compared with Curve J, a predicted relationship for small branch-to-main area ratios[1]. Curves J and K are in good agreement. Curve L falling below Curve J represents the effect of area ratio, and its relative position is in agreement with results in the paper by Korst[7]. It should be remarked that the Curve L area ratio is much larger than ordinarily used in practice.

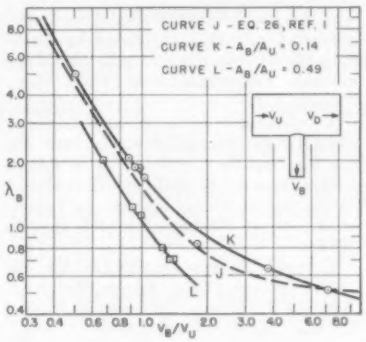

Fig. 8—Experimental and predicted results for cylindrical branch takeoffs

From an application standpoint, static pressure is frequently used as the design basis. Therefore, these same results are presented in Fig. 9 with the ordinate λ_{SP} denoting the loss in static pressure in terms of branch velocity heads. Corresponding Curves are K-N, J-M and L-P. Note that for velocity ratios less than 1.0, the curves based on static pressure are very sensitive to small differences between the λ_B curves of Fig. 8. Also, Curve M predicts the loss in static pressure is independent of velocity ratio; this was not pointed out in the source[1] and may have important theoretical or practical significance.

A conical takeoff has been shown to be effective in reducing the takeoff loss[1]. This is confirmed in Fig. 10 by the test results shown by Curve R. Comparison with Curve M, which applies to the type diagrammed in Fig. 9, shows the pressure loss is reduced to less than one-third at low velocity ratios. Curve S was obtained by converting available data on conical takeoffs to the static pressure basis. The lower loss for Curve S as compared with Curve R is a result of the larger ratio of inlet to branch duct areas.

The conical takeoff is very effective because it provides a nozzle type of entrance to the branch, whereas the cylindrical takeoff provides an orifice type of entrance. Separation of the flow from duct surfaces and resultant stream contraction are thereby reduced, and the pressure loss during re-expansion considerably lessened.

From the analysis and test results for the diverted-flow it is concluded that the experimental data are in

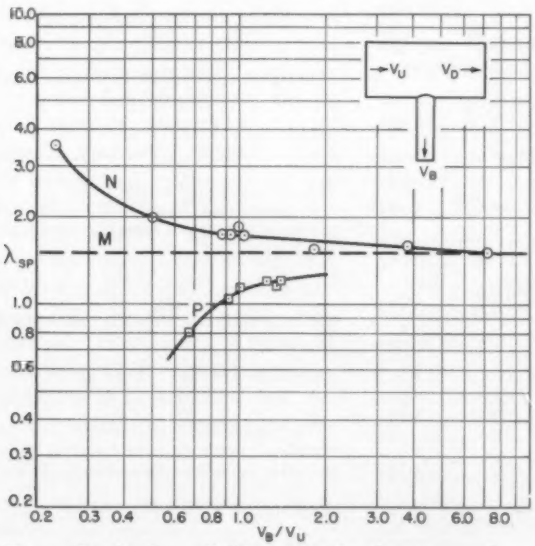

Fig. 9—Results for cylindrical takeoffs when expressed on static pressure basis

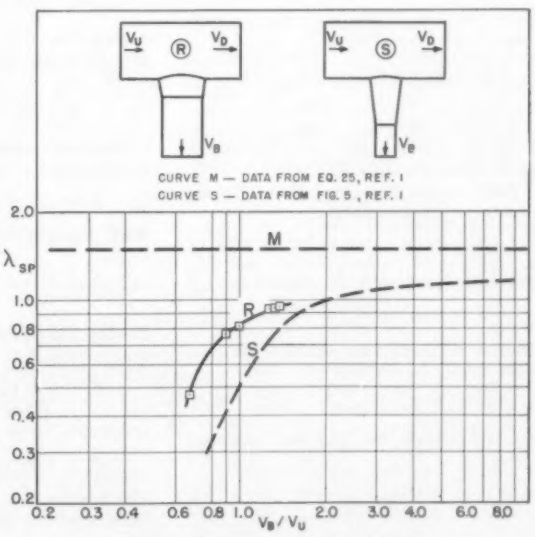

Fig. 10—Results for conical takeoffs

substantial agreement with works of others, and that the use of a conical takeoff will reduce takeoff losses considerably. For takeoffs of about the same configurations as those illustrated in Fig. 10, Curves R and S can be used directly for design data.

Conclusions

1. Analysis of the conventional method of correlating static regain test data shows that regain coefficients greater than 1.0 can be obtained.

2. Experimental data on the straight-through section follow the trend of the analytical relationships developed, and are considered representative of performance attainable in the field.

3. The static regain chart presented constitutes an improvement in design information available for medium and high velocity applications.

4. Results of branch takeoff tests correlate well with those of previous investigators.

5. Pressure losses of conical types of branch takeoffs are considerably less than those of cylindrical types. Information presented can be used directly as design data.

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APPENDIX

Development of λ_U Curves in Fig. 2: Equation 2 was divided by the upstream velocity head to obtain

$$H/(V_U^2/2g) = (1 - R)\ (V_U^2 - V_D^2)/V_U^2 \quad \text{.....(A-1)}$$

Designating the left side by λ_U and solving for R, there results

$$R = 1 - \lambda_U/[1 - (V_D/V_U)^2] \quad \text{.....(A-2)}$$

Since the area of the main duct is constant, it can be written as

$$R = 1 - \lambda_U/[1 - (Q_D/Q_U)^2] \quad \text{.....(A-3)}$$

Selected values were assigned to λ_U in Equation A-3 and the curves in Fig. 2 plotted from the equation.

Total Kinetic Energy of Flow: The increment of cross sectional area is

$$dA = 2\pi\ (r - y)\ dy \quad \text{.....(A-4)}$$

and from Equation 6 the velocity is

$$v = v_{max}\ (y/r)^{1/7} \quad \text{.....(A-5)}$$

Writing the continuity equation for constant density in the form

$$\pi\ r^2\ V = \int v\ dA \quad \text{.....(A-6)}$$

and substituting the first two equations yields

$$\pi\ r^2\ V = \int_o^r v_{max}\ (y/r)^{1/7}\ 2\pi\ (r - y)\ dy \quad \text{.....(A-7)}$$

For convenience, the integral is expressed in dimensionless form by setting

$$y/r = x \qquad 0 \le x \le 1$$

so that

$$dy = r dx$$

and Equation A-7 becomes

$$\pi\ r^2\ V = 2\pi\ v_{max}\ r^2 \int_o^1 x^{1/7}\ (1 - x)\ dx \quad \text{.....(A-8)}$$

Integration yields

$$v_{max} = 1.225\ V \quad \text{.....(A-9)}$$

Substituting this in Equation A-5, the velocity profile in terms of the mean velocity is

$$v = 1.225\ V\ (y/r)^{1/7} \quad \text{.....(A-10)}$$

The total kinetic energy over a cross section is given by

$$E = \rho/2 \int v^3\ dA \quad \text{.....(A-11)}$$

With Equations A-4 and A-10 this becomes

$$E = \rho/2 \int_o^r (1.225\ V)^3\ (y/r)^{3/7}\ 2\pi\ (r - y)\ dy \quad \text{.....(A-12)}$$

Following the procedure above, the dimensionless form is

$$E = \rho/2\ (2\pi\ r^3)\ (1.225\ V)^3 \int_o^1 x^{3/7}\ (1 - x)\ dx \quad \text{..(A-13)}$$

Integration yields

$$E = 1.06\ [\pi\ r^3\ \rho\ V^3/2] \quad \text{....(A-14)}$$

The bracketed term is the kinetic energy based upon the mean velocity of flow, E_m. Hence,

$$E = 1.06\ E_m \quad \text{.....(A-15)}$$

Thus the actual total kinetic energy of a seventh-root velocity profile is 6 percent greater than that computed from the mean velocity of flow. By a similar analysis with Equation 10, the excess is found to be 3 percent for a tenth-root profile.

Development of Regain Coefficient Curves: For the conditions stated in the text, the pressure rise is

$$(SP)_D - (SP)_U = (V_2/4005)^2 - (V_D/4005)^2 \quad \text{..(A-16)}$$

Substituting in Equation 7 and recalling that $A_U = A_D$, there is obtained

$$R = [(V_2/V_U)^2 - (Q_D/Q_U)^2]/1 - (Q_D/Q_U)^2 \quad \text{.....(A-17)}$$

From Fig. 4, the flow rate at Section 2 is seen to be

$$Q_2 = \pi\ (r - y_o)^2\ V_2 \quad \text{.....(A-18)}$$

which can also be written

$$Q_2 = \pi r^2\ (1 - x_o)^2\ V_2 \quad \text{.....(A-19)}$$

For Section U a similar expression is

$$Q_U = \pi r^2\ V_U \quad \text{.....(A-20)}$$

Dividing Equation A-19 by Equation A-20 and recalling that $Q_2 = Q_D$, there is obtained

$$V_2/V_U = [1/(1 - x_o)^2]\ (Q_D/Q_U) \quad \text{.....(A-21)}$$

which, when substituted in Equation A-17 yields

$$R = \{[1/(1 - x_o)^4] - 1\}\ (Q_D/Q_U)^2/[1 - (Q_D/Q_U)^2] \quad \text{.....(A-22)}$$

This is Equation 8 in the text.

Next, the flow rate ratio is related to x_o. Noting Equation A-8, the corresponding form for the Section 2 flow is

$$Q_2 = 2\ \pi\ v_{max}\ r^2 \int x_o^1\ x^{1/7}\ (1 - x)\ dx \quad \text{.....(A-23)}$$

Substituting Equation A-9 and integrating, the result is

$$Q_2 = \pi r^2\ V_U\ [1 + (8/7)\ x_o^{15/7} - (15/7)\ x_o^{8/7}] \quad \text{.....(A-24)}$$

Utilizing Equation A-20, and again recalling that $Q_2 = Q_D$, the final form is

$$Q_D/Q_U = 1 + (8/7)\ x_o^{15/7} - (15/7)\ x_o^{8/7} \quad \text{.....(A-25)}$$

This is Equation 9 in the text.

A generalized form of Equation A-25 can be obtained by expressing the velocity profile as

$$V = v_{max}\ (y/r)^{1/n} \quad \text{.....(A-26)}$$

and repeating the foregoing development. The result is

$$Q_D/Q_U = 1 + (1 + 1/n)\ x_o^{2+1/n} - (2 + 1/n)\ x_o^{1+1/n} \quad \text{..(A-27)}$$

The applicable relationship for the tenth-root profile given by Equation 10 can therefore be written immediately. It is

$$Q_D/Q_U = 1 + 1.1\ x_o^{2.1} - 2.1\ x_o^{1.1} \quad \text{.....(A-28)}$$

This and Equation 8 in the text were used to obtain Curve G of Fig. 5.

Thermal Design of Warm Water Ceiling Panels

Prepared by

A Subcommittee* of TAC on Panel Heating & Cooling

and

Members of the Staff‡ of The ASHAE Research Laboratory

THE FOLLOWING procedure is based on a solid foundation of research and provides a reliable means for the thermal design of ceiling-type heating panels using warm water as the heating medium. With its simplicity, it retains engineering accuracy appropriate to the usual applications of panel heating in residential and commercial buildings.

The basis of this procedure is a body of experimental data obtained at the ASHAE Research Laboratory in a comprehensive program planned and guided by the Technical Advisory Committee on Panel Heating and Cooling. This work has been reported in the following research papers:

REFERENCE LIST OF LABORATORY REPORTS

1. ASHVE RESEARCH REPORT No. 1388 — Heat Flow Analysis in Panel Heating or Cooling Sections, Case I — Uniformly Spaced Pipes Buried within a Solid Slab, by L. E. Hulbert, H. B. Nottage, and C. V. Franks (ASHVE TRANSACTIONS, Vol. 56, 1950, p. 189).

2. ASHVE RESEARCH REPORT No. 1387 — Laboratory Studies on Heat Flow Within a Concrete Panel, by C. M. Humphreys, H. B. Nottage, C. V. Franks, R. G. Huebscher, L. F. Schutrum and D. W. Locklin (ASHVE TRANSACTIONS, Vol. 56, 1950, p. 175).

3. ASHVE RESEARCH REPORT No. 1426 — Laboratory Studies of the Thermal Characteristics of Plaster Panels, by C. M. Humphreys, C. V. Franks and L. F. Schutrum (ASHVE TRANSACTIONS, Vol. 57, 1951, p. 363).

4. ASHVE RESEARCH REPORT No. 1491 — Further Studies of the Thermal Characteristics of Plaster Panels, by L. F. Schutrum, C. M. Humphreys (ASHVE TRANSACTIONS, Vol. 59, 1953, p. 511).

5. ASHVE RESEARCH REPORT No. 1444 — The ASHVE Environment Laboratory, by Cyril Tasker, C. M. Humphreys, G. V. Parmelee and L. F. Schutrum (ASHVE TRANSACTIONS, Vol. 58, 1952, p. 139).

6. ASHVE RESEARCH REPORT No. 1473 — Heat Exchanges in a Ceiling Panel Heated Room, by L. F. Schutrum, G. V. Parmelee and C. M. Humphreys (ASHVE TRANSACTIONS, Vol. 59, 1953, p. 197).

7. ASHVE RESEARCH REPORT No. 1499 — Effects of Non-Uniformity and Furnishings on Panel Heating Performance, by L. F. Schutrum and C. M. Humphreys (ASHVE TRANSACTIONS, Vol. 60, 1954, p. 121).

8. ASHVE RESEARCH REPORT No. 1516 — Effects of Room Size and Non-Uniformity of Panel Temperature on Panel Performance, by L. F. Schutrum and J. D. Vouris (ASHVE TRANSACTIONS, Vol. 60, 1954, p. 455).

Findings from these studies have been weighed as to importance, and then trimmed to meet the needs of a simple but accurate design procedure.

The simplified procedure provides a panel design to maintain the desired room air temperature for the selected outdoor conditions. Room air temperature is the selected criterion of comfort, and the design procedure is restricted to situations in which the area weighted average temperature of the walls, the floors, and glass does not differ greatly from room air temperature. The room-scale tests, which simulated various conditions of construction and outdoor temperature, showed that this near-equality of the two temperatures normally prevails.

Design Steps

Panel design requires specification of the following: panel area, size, spacing and depth of bury of the pipe or tube, insulation on the rear side of the panel, the temperature drop and the mean temperature of the water. The procedure, summarized, is as follows:

a Calculate the hourly rate of heat loss for each room.

b Determine the available area for the panel in each room.

c Calculate the required unit panel output.

d Determine the required panel surface temperature.

e Select type, size and spacing of pipe or tube, and the insulation for the rear of the panel.

f Determine the required mean water temperature.

g Design the fluid circuit (panel piping and mains) and determine the size of the heating equipment, following conventional practice.

Range of Application

The design procedure described here is applicable to space heating systems which employ large heated ceiling areas operated at relatively low average surface temperatures. Other limitations are:

Outside design conditions: Temperatures as low as −30 F.

Room air temperature: 70 to 76 F.

Air changes: No more than two air changes per hour.

Room dimensions: Rooms having normal proportions; ceiling height between 7 and 12 ft.

Room construction: Any type of wall construction and any amount of glass area. (Both however have an effect upon comfort). Conventional interior finishes and furnishings.

Panel construction: Plaster, metal, or concrete panels shown in Tables 1 and 2. Any type of construction above panel. Panel surface exposed to room.

Personnel: R. L. Maher, chairman; W. P. Chapman, H. T. Gilkey, P. B. Gordon, E. F. Snyder and J. M. van Nieukerken.

‡*Personnel*: L. F. Schutrum, C. M. Humphreys and G. V. Parmelee.

For presentation at the 62nd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Cincinnati, Ohio, January 1956.

Journal Section

Procedure for Hot-Water Plaster Ceiling Panels

Step 1. *Heat Loss*: Calculate the heat loss of each room, following the recommendations contained in the ASHAE GUIDE, but do not include any heat loss through the area covered by the panel.

Example: Three Rooms, A, B, and C, are to have a common water supply temperature; that is, they represent a single zone. They are to be maintained at 72 F air temperature when the outdoor air temperature is zero F. The ceilings of Rooms A and B have floors above them with the space heated to 72 F and an air-to-air U value of 0.25 Btu per (hr) (sq ft) (F). The ceiling of Room C has insulation in the joist spaces and an uninsulated attic space with a combined U value of 0.05 from Room C to outdoor air. Room dimensions and calculated heat losses are as follows:

Room	Ft	Btu/Hr
A	11 × 12 × 8	6300
B	11 × 12 × 8	2500
C	15 × 12 × 8	8000

Nomenclature

A_p = panel area, square feet.
C = coefficient of heat transfer, Btu per (hour) (square foot) (Fahrenheit degree), from the upper surface of the concrete slab which forms the ceiling panel to point at which t_h is taken. (See definition of t_h.)
q_d = panel output (downward heat flow), Btu per (hour) (square foot).
q_u = upward heat flow from panel, Btu per (hour) (square foot).
r_d = thermal resistance of panel to downward heat flow (Fahrenheit degrees) (hour) (square foot) per Btu.
r_u = thermal resistance of panel to upward heat flow (Fahrenheit degrees) (hour) (square foot) per Btu.
t_a = design room air temperature, Fahrenheit.
t_h = air temperature, Fahrenheit, at some point above the panel. It may be the temperature of the air in a room or an attic space above the panel, or the outside air temperature. In any case, the value of U or C for the construction above the panel must be consistent with the point at which t_h is taken.
t_i = inlet water temperature, Fahrenheit.
t_o = outlet water temperature, Fahrenheit.
t_{mw} = mean water temperature, Fahrenheit.
t_{max} = maximum water temperature permissible for a given construction, Fahrenheit.
t_{dmw} = design mean water temperature (selected for each zone), Fahrenheit.
t_p = panel surface temperature, Fahrenheit.
U = overall coefficient of heat transfer, Btu per (hour) (square foot) (Fahrenheit degree), for the construction between room air and the point at which t_h is taken. (See definition of t_h.)

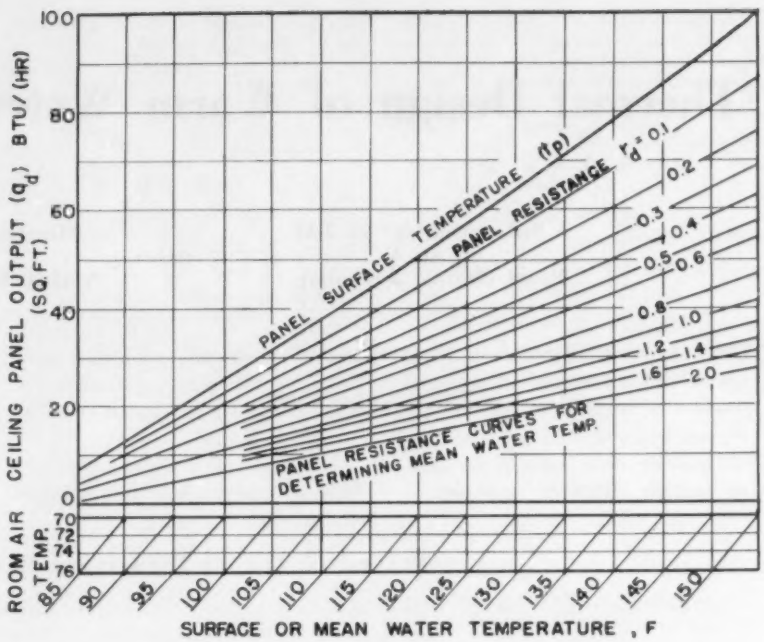


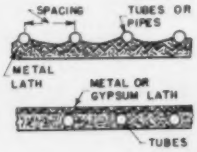
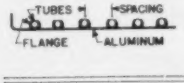
Fig. 1—Ceiling panel design graph-panel surface temperature and mean water temperature *vs.* output downward

Step 2. *Required Panel Output*: Divide the heat loss of each room by the maximum ceiling area in the room which can be used as a heating panel. This is the minimum heat output per square foot of panel which will satisfy the requirements of the room. (The panel which requires the highest output per square foot will generally control the design, because the temperature of the water must be high enough to produce the required output from that panel.)

Room	Available Panel Area, Sq Ft	Required Panel Output q_d, Btu/(Hr) (Sq Ft)
A	132	6300/132 = 47.7
B	127	2500/127 = 19.7
C	306	8000/306 = 26.1

Step 3. *Panel Surface Temperature*: From Fig. 1, find the panel surface temperature needed to yield the required heat output to each room, using the output determined in Step 2 and the design room air temperature. This use of Fig. 1 is shown in illustration 1A.

Table 1—Thermal Resistance of Plaster and Metal Ceiling Panels

	Spacing in.	Thermal resistance to downward heat flow (r_d) Heat flow Ratio, q_u/q_d = 0	0.2	0.4	0.6	0.8	1.0[a]
PLASTER PANELS[b] STANDARD GYPSUM PLASTER, THREE COATS	4½	0.30	0.34	0.38	0.42	0.46	0.50
 ⅜ in. (nom.) non-ferrous tube or ½ in. (nom.) ferrous pipe *above* metal lath tied at 8-inch intervals with good tube embedment, or ⅜ in. (nom.) non-ferrous tube *below* metal or gypsum lath.	6	0.45	0.51	0.57	0.63	0.69	0.75
	9	0.75	0.85	0.95	1.05	1.15	1.25
	12	1.15	1.29	1.43	1.57	1.71	1.85
ALUMINUM PANEL[c] 1/16 IN. MINIMUM THICKNESS							
 pipe or tube installed so that excellent heat conduction to ceiling surface is obtained.	3	0.07	0.07	0.07	0.07	0.07	0.07

[a] See note in table 2.
[b] Recommended maximum inlet water temperature (t_{max}) 140 F.
[c] Recommended maximum inlet water temperature (t_{max}) 220 F.

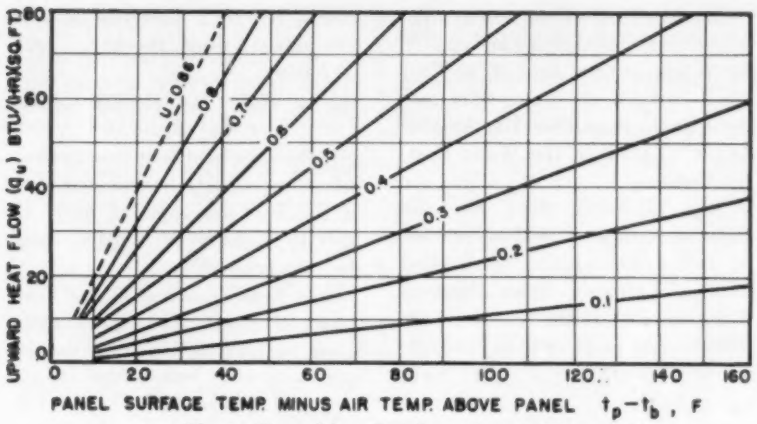
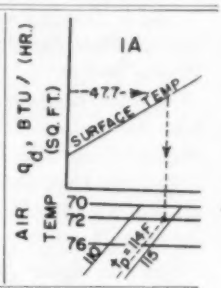


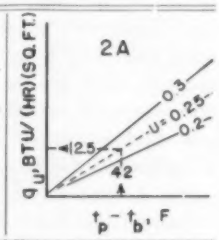
Fig. 2—Upward heat flow from plaster ceiling panel

Room	t_p, F Deg
A	114
B	92
C	97



Step 4. Upward Heat Flow: Determine the upward heat flow from each panel using Fig. 2. The upward heat flow must be determined in order to obtain the downward panel resistance and to size the boiler. The use of Fig. 2 is given in illustration 2A. Note that the U values to be used with the graph are those for the entire construction of which the panel is a part, and are taken from room air temperature, (t_a) to air temperature above the panel, (t_b). (See Appendix). The U factors may be obtained from THE GUIDE.

Room	U	$t_p - t_b$	q_u
A	0.25	42	12.5[a]
B	0.25	20	6[a]
C	0.05	97	5[a]



[a]In Btu per (hour) (square foot).

TABLE 2—Thermal Resistance of Concrete Ceiling Panels

Panel Construction	Spacing in.	Thermal Resistance, Heat Flow Ratio q_u/q_d = 0 up r_u	0 down r_d	0.5[a] up r_u	0.5[a] down r_d	1.0[a] up r_u	1.0[a] down r_d
6 IN. CONCRETE SLAB — 1 IN. COVER							
½ in. (nom.) non-ferrous tube	9	3.6	0.30	0.9	0.35	0.7	0.45
	12	5.1	0.35	1.1	0.45	0.9	0.55
½ in. (nom.) ferrous pipe or ¾ in. (nom.) non-ferrous tube	9	2.6	0.25	0.7	0.30	0.6	0.35
	12	4.0	0.30	0.9	0.40	0.8	0.50
¾ in. (nom.) ferrous pipe or 1 in. (nom.) non-ferrous tube	9	2.1	0.20	0.6	0.25	0.6	0.30
	12	3.3	0.30	0.8	0.35	0.7	0.40
	15	4.5	0.35	1.0	0.45	0.8	0.55
1 inch (nom.) ferrous pipe	9	1.6	0.20	0.5	0.25	0.5	0.25
	12	2.6	0.25	0.7	0.30	0.6	0.35
	15	3.6	0.30	0.9	0.40	0.7	0.45
8 IN. CONCRETE SLAB — 1 IN. COVER							
½ in. (nom.) non-ferrous tube	9	3.6	0.30	1.0	0.35	0.8	0.40
	12	5.2	0.35	1.2	0.45	1.0	0.55
½ in. (nom.) ferrous pipe or ¾ in. (nom.) non-ferrous tube	9	2.9	0.25	0.9	0.30	0.8	0.35
	12	4.0	0.30	1.1	0.40	0.9	0.45
¾ in. (nom.) ferrous pipe or 1 in. (nom.) non-ferrous tube	9	2.2	0.20	0.8	0.30	0.7	0.30
	12	3.3	0.30	1.0	0.35	0.8	0.40
	15	4.3	0.35	1.1	0.40	0.9	0.50
1 in. (nom.) ferrous pipe	9	1.7	0.20	0.7	0.25	0.7	0.25
	12	2.7	0.25	0.9	0.30	0.8	0.35
	15	3.7	0.30	1.0	0.40	0.9	0.45

[a]Any ceiling panel also acts as a floor panel to the extent of its upward heat flow. If the upward heat flow is high and the space above is occupied,. check floor surface temperature for possible foot discomfort (see RESEARCH REPORT NO. 1490 — Heat Exchanges in a Floor Panel Heated Room, by L. F. Schutrum, G. V. Parmelee and C. M. Humphreys, ASHVE TRANSACTIONS, Vol. 59, 1953, p. 495). Also check effect on heating requirements of the space above. It is not good practice to have the major portion of the upper room's heating requirements supplied by the upward heat flow of a ceiling panel below.

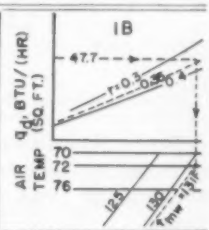
Journal Section

Step 5. Downward Panel Resistance: Assume tentative pipe or tube spacings for the panel construction to be used from those listed in Table 1, choosing the closer spacings when higher outputs are required. In the same table, find the resistance of each panel (r_d), using heat flow ratios calculated from the flow rates determined in Steps 2 and 4, interpolating as required.

Room	Spacing in.	Heat Flow Ratio	Resistance (r_d)
A	4-½	$\frac{12.5}{47.7} = 0.26$	0.35
B	9	$\frac{6}{19.7} = 0.30$	0.90
C	9	$\frac{5}{26.1} = 0.19$	0.85

Step 6. Mean Water Temperature: For the required panel output (q_d) found in Step 2, the panel resistance (r_d) found in Step 5, and the room air temperature (t_a), find the mean water temperature (t_{mw}) from Fig. 1. This use of Fig. 1 is shown in illustration 1B.

Room	t_{mw}, F Deg
A	131
B	110.5
C	119



Step 7. Design Mean Water Temperature: Select a single mean water temperature (t_{dmw}) for each group of rooms which is to comprise a zone, choosing the highest mean water temperature (t_{mw}) of the group subject to the following:

1. If $t_{mw} + ½ (t_i - t_o)$ is equal to or less than t_{max} (see Nomenclature and Table 1), this mean water temperature (t_{mw}) is an acceptable design mean water temperature (t_{dmw}). Proceed to Step 8.
2. If $t_{mw} + ½ (t_i - t_o)$ is greater than t_{max}, go back to Step 5 and select a panel construction which has a lower panel resistance (r_d). This can be accomplished by:

a. Reducing the tube spacing, and/or
b. Decreasing the upward heat flow (q_u) by providing additional insulation above the panel.

If the required mean water temperature is still too high:

a. Reduce the heat loss of the room; and/or

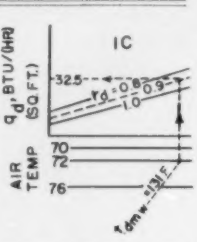
b. Provide supplementary heating.

In the example, assume $t_i - t_o = 15$ F and $t_{max} = 140$ F. Then since $t_{mw} = 131$ F, $t_{mw} + \frac{1}{2}(t_i - t_o) = 138.5$ F and is less than t_{max}. Thus 131 F can be used as the design mean water temperature (t_{dmw}).

Step 8. *Design Panel Output*: From Fig. 1, find the panel output (q_d) for design mean water temperature (t_{dmw}), room air temperature (t_a) and panel resistance (r_d). Illustration 1C shows how Fig. 1 is used in this step.

The mean water temperature (t_{mw}) of 131 F, found for Room A in Step 6, is used as the design mean water temperature (t_{dmw}). The panel output for Room A which was determined in Step 2 is therefore the design panel output for this room. Design panel outputs for Rooms B and C can be found from Fig. 1 using the design mean water temperature (t_{dmw}).

Room	Design Panel Output[a] (q_d)
A	47.7
B	32.5
C	33.0



[a]In Btu per (hour) (square foot).

Step 9. *Design Panel Area*: Divide the room heat loss found in Step 1 by the design panel output found in Step 8.

Room	Design Panel Area (A_p), Sq Ft
A	132[a]
B	77
C	242

[a]Unchanged from Step 2

Step 10. *Total Panel Output*: Add the heat flow upward (q_u) to the design panel output (q_d) and multiply by the design panel area to obtain the total panel output. If the design panel output is different from the panel output (q_d) used in Steps 3 and 4, the heat flow upward (q_u) should be redetermined.

Room	q_u	q_d	$q_u + q_d$	A_p	Total Panel Output[b]
A	12.5	47.7	60.2	132	7946
B	9.5[a]	32.5	42.	77	3234
C	5.5[a]	33	38.5	242	9317

[a]Redetermined. [b]In Btu per hour, and equals $A_p(q_u + q_d)$

Step 11. *Fluid Circuit*: Design the fluid circuit (panel piping and mains) for a temperature drop of 10 F to 20 F between the water inlet and outlet of the panel (See THE ASHAE GUIDE, Chapter on Hot Water Heating Systems).

Step 12. *Boiler Size*: Size the boiler according to method outlined in THE GUIDE, chapter on Heating Boilers, Furnaces, Space Heaters. The new Btu rating of the boiler should equal or exceed the total output of all panels plus any other loads on the boiler.

Procedure for Hot-Water Metal Ceiling Panels

Follow the procedure for Hot-Water Plaster Ceiling Panels.

Procedure for Hot-Water Concrete Ceiling Panels

The procedure for hot-water plaster ceiling panels cannot be applied in its entirety to concrete ceiling panels because some of the simplifying assumptions regarding the upward heat flow from plaster panels are not valid for concrete panels. The necessary modification of the procedure for plaster ceiling panels is outlined in the following steps:

Step 1. *Heat Loss*: Follow the procedure for Hot-Water Plaster Panels, Step 1.

Step 2. *Required Panel Output*: Follow the procedure for Hot-Water Plaster Panels, Step 2.

Step 3. *Panel Surface Temperature*: Follow the procedure for Hot-Water Plaster Panels, Step 3.

Step 4. *Upward Heat Flow Estimate*: Determine the coefficient of heat transfer (C) from the upper surface of the slab to air above the panel (temperature, t_b), using factors from THE GUIDE. Estimate the heat flow upward (q_u) by the following equation.

$$q_u = C(t_p - t_b) \text{ Btu per (hr) (sq ft)}$$

Step 5. *Upward and Downward Panel Resistance*: Follow the procedure for Hot-Water Plaster Panels, Step 5, using Table 2 to find both resistances (r_u and r_d).

Step 6. *Mean Water Temperature and Upward Heat Flow*: 1. Follow the procedure for Hot-Water Plaster Panels, Step 6; 2. Calculate the heat flow upward from the panel (q_u) as follows:

$$q_u = (t_{mw} - t_b)/(1/C + r_u) \text{ Btu per (hr) (sq ft)}$$

If the calculated heat flow upward differs appreciably from the estimate of the heat flow upward made in Step 4, repeat Steps 5 and 6 using the calculated value.

Step 7. *Design Mean Water Temperature*: Select the highest mean water temperature (t_{mw}) as the design mean water temperature (t_{dmw}).

Step 8. *Design Panel Output*: Follow the procedure for Hot-Water Plaster Panels, Step 8.

Step 9. *Design Panel Area*: Follow the procedure for Hot-Water Plaster Panels, Step 9.

Step 10. *Total Panel Output*: Follow the procedure for Hot-Water Plaster Panels, Step 10.

Step 11. *Fluid Circuit*: Follow the procedure for Hot-Water Plaster Panels, Step 11.

Step 12. *Boiler Size*: Follow the procedure for Hot-Water Plaster Panels, Step 12.

APPENDIX

All of the figures and tables included in the Design Procedure are based on data developed at the ASHAE Research Laboratory. The methods by which the figures and tables were derived are described in this Appendix.

Fig. 1. Ceiling Panel Design Graph

The curves of this figure consist of one curve and a family of curves. The single curve shows ceiling panel output (q_d) versus panel surface temperature (t_p). The group of curves relates ceiling panel output to mean water temperature (t_{mw}) for a series of panel thermal resistances (r_d). The construction at the abscissa serves to adapt the scale drawn for 70 F room air temperature for other design room air temperatures.

The curve of ceiling panel output versus panel surface temperature was plotted from a series of points which were calculated by using the equations which describe panel performance. To locate a point, a room air temperature (t_a) and an average unheated surface temperature ($AUST$) were assumed, and because the latter temperature describes the heating requirements of a room which has the assumed air temperature, the panel surface temperature (t_p) and the panel output (q_d) could be determined by calculation. The procedure followed was:

Nomenclature in Appendix

The following terms are used in the Appendix and are not defined in the paper:

Δt = decrease in room air temperature caused by infiltration (see Reference 6, Fig. 9).

$AUST$ = area weighted average temperature of unheated surfaces in room, F.

q_{rd} = radiation component of panel output (downward heat flow), Btu per (hour) (square foot).

q_{cd} = convection component of panel output (downward heat flow), Btu per (hour) (square foot).

q'_{cd} = convection component of panel output (downward heat flow), for no infiltration, Btu per (hour) (square foot).

Δq_{cd} = increase in convection component of panel output (downward heat flow) caused by infiltration, Btu per (hour) (square foot).

f = conventional conductance of panel surface, Btu per (hour) (square foot) (Fahrenheit).

r_p = conventional thermal resistance of plaster in panel (hour) (square foot) (Fahrenheit) per Btu.

a & b = coefficients used in Equation A-8. (see Reference 3, Equation 2).

c = thermal resistance between water in pipe or tube and outer surface of pipe or tube (hour) (square foot) (Fahrenheit) per Btu.

K, θ_p, t, m, b_1, L, $(q/A)_1$, $(q/A)_2$ = coefficients used in Equation A-9 (see Reference 1, Equations 3, 4, and 5).

1. Calculate the panel surface temperature by the equation:

$$t_p = [(t_a + \Delta t) - AUST]/0.08 + AUST \quad \text{.....(A-1)}$$

This is an empirical equation derived from laboratory tests and reported in Reference 6, where it appears in Fig. 7. The temperature $(t_a + \Delta t)$ is room air temperature for one air change per hour adjusted to room air temperature for no infiltration by adding the decrease in air temperature (Δt) caused by infiltration observed in laboratory tests. The latter observations are presented in Fig. 9 of Reference 6. Infiltration air at 0 F was assumed.

2. Calculate the radiation output of the panel by the equation:

$$q_{rd} = 1.52 \times 10^{-9} [(t_p + 460)^4 - (AUST + 460)^4] \quad \text{.....(A-2)}$$

This is the Stefan-Boltzmann equation with a constant which was determined empirically from tests.

3. Calculate the convection output of the panel by the equation:

$$q_{cd} = 0.021 [t_p - (t_a + \Delta t)]^{1.25} + \Delta q_{cd} \quad \text{.....(A-3)}$$

Equation A-3 is an empirical adaptation of the generally accepted equation for convection and based on tests which have been conducted at the Research Laboratory but which have not yet been published. The method of testing the performance of the panels gave the convection output for the condition of no infiltration, which was then increased to the output obtained with infiltration by adding Δq_{cd}. The value of Δq_{cd}, the additional heat flow from the ceiling due to infiltration, is shown in Fig. 4 of Reference 6.

The radiation and convection outputs were added to obtain the total downward output and the latter was plotted against panel surface temperature (t_p) and room air temperature (t_a) to construct the curve.

The following table shows representative results of applying the foregoing equations:

t_a	72	72	72	72
$AUST$	71	72	72.5	73
Δt	3.6	3.6	3.6	3.6
t_p	128.5	117.	111.3	105.5
q_{rd}	61.7	46.9	39.9	32.9
q'_{cd}	3.0	2.2	1.8	1.5
Δq_{cd}	2.2	2.0	1.9	1.9
q_d	66.9	51.1	43.6	36.3

The family of curves relating ceiling panel output (q_d) to mean water temperature (t_{mw}) were plotted from:

$$t_{mw} = t_p + r_d\,(q_d) \quad \text{.....(A-4)}$$

The construction at the abscissa applies the following corrections:

t_p (at air temperature, t_a) = t_p (at air temperature 70 F) + 5/6 (t_a − 70 F) ..... (A-5)

and

t_{mw} (at air temperature, t_a) = t_{mw} (at air temperature 70 F) + 5/6 (t_a − 70 F) ..... (A-6)

This linear correction is sufficiently accurate for practical purposes in the range of air temperatures 70 F to 76 F.

In the ASHAE Environment Laboratory the test room conditions were (Reference 5):

1. Dimensions 24 ft, 6 in. × 12 ft × 8 ft;
2. Emissivity of room surfaces 0.92‡;
3. Entire ceiling a heating panel;
4. All unheated surfaces at a uniform temperature *i.e.* no colder areas simulated windows or doors;
5. No furnishings;
6. Infiltrating air 0 F;
7. Stable (steady state).

Tests established that the effect on panel output was negligible if room dimensions were changed, if only part of the ceiling were heated, if unheated surfaces were not at uniform temperatures, and if room furnishings were added (References 7 & 8). The emissivity used is representative of the emissivities of conventional wall surfaces and furnishings and is applicable to all but those which have special heat reflective properties. The effect of infiltration of air at temperatures other than 0 F and the effect of different rates of infiltration can be estimated from data reported in Reference 6.

Fig. 2. Upward Heat Flow from Plaster Ceiling Panels

The upward heat flow from a plaster ceiling panel is:

$$q_u = (t_p - t_b)/[(1/U) - (1/f) - r_p] \quad \text{.....(A-7)}$$

The average temperature of the surface of the upperside of the panel was found to be practically the same as panel surface temperature (t_p) and for that reason the latter is used. For convenience, the thermal resistance between the upperside of the panel and the air above the panel is expressed in terms of the conventional thermal resistance from room air to air above the panel (U), minus the resistance of the air film at the panel surface (f = 1.95), and also minus the resistance of the plaster of the panel (r_p = 0.14). These latter 2 resistances are constant for the plaster panels shown in Table 1 and for that reason the graph can be constructed in terms of q_u, U and $(t_p - t_b)$.

The actual upward heat flow from metal ceiling panels will be slightly less than that shown on the graph because r_p for metal panels is very small.

‡Research Report No. 1528—Measurement of Angular Emissivity, by Aydin Umur, G. V. Parmelee and L. F. Schutrum (ASHAE Transactions, Vol. 61, 1955, p. 111).

Table 1. Thermal Resistance of Plaster and Metal Ceiling Panels

The thermal resistance of plaster panels to downward heat flow (r_d) was calculated from:

$$r_d = a + (q_u/q_d)\ b + c \quad \text{.....(A-8)}$$

This is essentially Equation 2 of Reference 3 with term c added. The latter is a small resistance added to adjust for the resistance to heat flow from the water in the tube to the outer surface of the tube which was not measured in the laboratory (see The ASHAE Guide Chapter on Heat Transfer). The values of a and b, determined by taking the average of the results obtained in the tests of the three better panels described in Reference 4, are:

Spacing in.	a	b
4½	0.280	0.175
6	0.415	0.295
9	0.720	0.515
12	1.125	0.695

The thermal resistance of the metal panel to downward heat flow was determined from routine tests of the heat transfer through the panels of the ASHAE Environment Laboratory, for which no published paper is available.

Table 2. Thermal Resistance of Concrete Ceiling Panels

The thermal resistance of concrete panels to downward and upward heat flow (r_d and r_u) were calculated from:

$$r_d \text{ or } r_u = (1/k)[(k\theta_p s/m) + (b_1^2/L)] + (1/k)[(q/A)_2/(q/A)_1][(k\theta_p s/m) + (b_1^2/L) - b_1] + c \quad \text{.....(A-9)}$$

This equation was derived from Equations 3, 4 and 5 of Reference 1. It will yield the resistance of the panel to either downward or upward heat flow depending upon which surface of the panel is identified with subscript (1). The value of $k\theta_p s/m$ was determined from the graphs, Fig. 6a to 6f, of Reference 1. The thermal resistance between the water in the tube is the term c in Equation A-9 which is the same as term c in Equation A-8.

Dr. R. W. Keeton to Get F. Paul Anderson Medal

Robert Wood Keeton, M.D., is to be the recipient of the fourteenth award of the F. Paul Anderson Medal. Formal presentation of the medal by Pres. John E. Haines will be a feature of the annual banquet at the 62nd Annual Meeting, January 23-25, in Cincinnatti, O.

Dr. Keeton, continuously connected with the College of Medicine of the University of Illinois from 1925 to 1951, has provided much of the leadership which permitted the planning and completion of a long series of studies at the University dealing with the subject of man's reactions to the effects of his air environment. The papers and reports resulting are outstanding contributions to the available information on this subject used by engineers. In many of these studies the Society has cooperated directly with the University.

Not only has Dr. Keeton made outstanding contributions to new knowledge, but he has also been an able practicing physician in Chicago since 1918. Always a teacher and educator, Dr. Keeton administratively directed the activities of the large staff of the Department of Internal Medicine at the University of which he long served as professor and department head. Held in high esteem by his colleagues and co-workers, more than 400 of his associates paid tribute to him at a banquet in Chicago on his retirement from the University staff in 1951. Dr. Keeton continues to be actively interested in the air environment work at the University.

Born in West Point, Miss., Dr. Keeton's professional life has been spent in Chicago. He has received A. B. degrees from Cumberland University, Millikin University, and the University of Chicago; an M. S. degree from the University of Chicago and an M. D. degree from Northwestern University.

Dr. Keeton is one of the few medically-trained individuals in this country who is continuously active in our field, and he has been a Society Member since 1943. In addition to directing the ASHAE-sponsored cooperative physiological research projects at the University, Dr. Keeton has contributed freely of his time to many other Society activities. He served on the Committee on Research

from 1952 to 1954. He is the author or co-author of 13 scientific papers presented at Society meetings on various phases of physiological research. His continuing interest in Society affairs is shown by his present membership on our TAC on Physiological Research and the Joint Committee on Standards for Comfort Air Conditioning.

In addition to the Society, Dr. Keeton is a member of many other organizations including the American College of Physicians, American Medical Association, American Physiological Society, American Society of Pharmacology, Society of Experimental Biology and Medicine, Association of American Physicians, The Central Interurban Club, Chicago Society of Internal Medicine and The Institute of Medicine of Chicago, Chicago Heart Association and many fraternal societies.

The F. Paul Anderson Medal was established in 1930 by a gift of the late Thornton Lewis of Philadelphia, Pa., who was president of the Society in 1929. Dean F. Paul Anderson of the University of Kentucky, for whom the award is named, was Society president in 1927.

Members of the 1955 F. Paul Anderson Award Committee are John W. James, Chicago, Ill., chairman; Lester T. Avery, Cleveland, O.; P. D. Gayman, Milwaukee, Wis.; E. P. Heckel, Chicago, Ill.; and Reg. F. Taylor, Houston, Tex.

Season's Greetings

This is the time of year when all should pause for a few minutes to review past successes as well as failures and to plan for the future.

We only receive what we desire from those things which we have contributed. There is no other way.

I sincerely hope that each of you will have a very enjoyable Christmas and, of still more importance, a happy and prosperous 1956.

John E. Haines
PRESIDENT

THE PRESIDENT'S PAGE

The Value of Research

THE development since 1920 of the research activities of the Society, which include the Laboratory, cooperative research, the Committee on Research, and the many Technical Advisory Committees, parallels the growth of the heating and air-conditioning industry.

It also parallels the growth of that branch of our profession that helped the engineering of heating and air conditioning to grow into the present overall art and science that now provide the data for design and installation of optimum thermal environment for living, working and maintaining industrial processes.

The Society should claim credit for its part in this extraordinary growth and development, and for its interest in the reviewing, developing, studying and publishing, and thereby making available to all, data on many important subjects.

The growth of The Guide during the past 35 years has been noteworthy, and The Guide is used and valued by the profession as the "Bible" of the industry.

The increasing accumulation of data published by the Society which are used universally by the industry and the profession in their everyday work also parallels the history of the Society research program and the founding of the Laboratory in 1919.

Much of The Guide information was developed at the Laboratory, or through cooperative research, which was stimulated by Society research activities.

Our Society's research program serves a very definite function in the heating and air-conditioning field, but it cannot accomplish some of the things which some members expect of it.

We do not maintain a testing laboratory for commercial products. We cannot do very much development of new methods, new equipment, and new processes. This type of research requires lots of money, full-scale field tests and all of the gadgets which are more complex and more important to the successful working of such systems than the fundamental characteristics of flow, pressure, comfort, efficiency, impurities, ventilation, odors, noise, and similar studies.

Engineers and manufacturers will always and should always develop and try new ideas. They will gamble on these ideas with the possibility of ultimate future financial return for themselves. However, such a gamble and such projects are not properly in the province of Society research.

It is not at all unusual for new developments by manufacturers in the industry to move along so fast through field tests and temporary design that organized research lags behind many trial and error installations.

When a new or experimental principle has broad usage and the fundamental design data are conflicting and confused, as so often happens, it is then time for the Society to step in and establish reliable data which can be used with confidence.

The Society's published data must be correct and sound. The Guide must be and is the "Bible" of the industry. The Society's research and publications must, therefore, necessarily lag behind some newer developments in the field of heating and air conditioning.

But if we do not pull together all of the information and establish usable data, who is going to do it?

The Society has spent more than two million dollars on research, but this does not represent the actual expenditure of time and money. Hundreds of the top men in the field of heating and air conditioning have given many hours of their time and knowledge to the Society's research program. This professional time could not be bought for many millions of dollars.

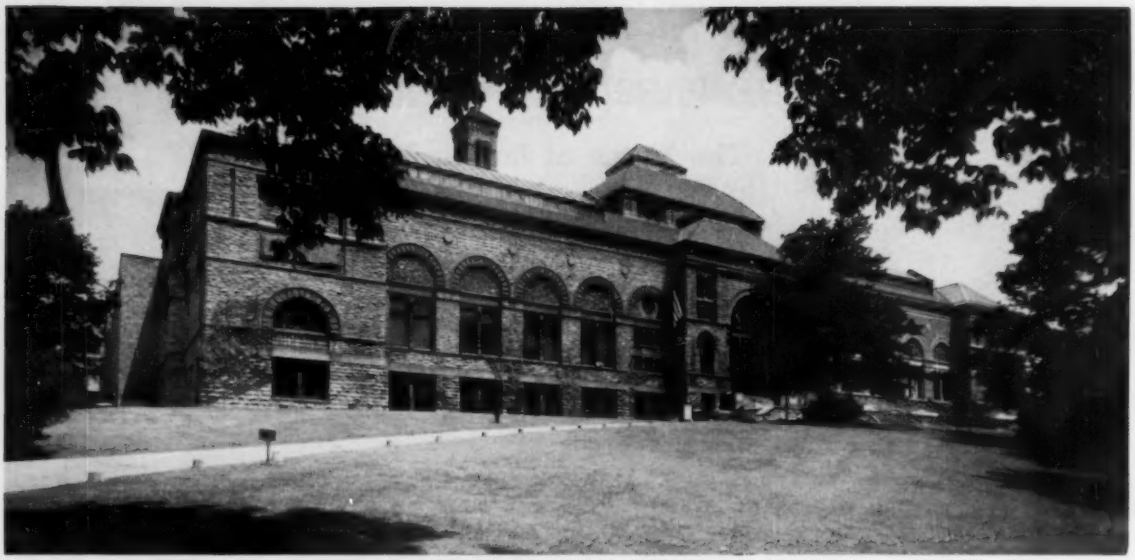
The general research policy of the Society is expressed in the following paragraph of a resolution adopted by the Council early this year:

"That the Society continues to accept the responsibility to the general public, to the members of the Society and to the industry, to maintain and support a cross-industry program of research designed to serve the members, industry, and the general public."

We should all be very proud of our Society's research accomplishments and look forward to the future accomplishments of our continually expanding research program.

John E. Haines

President
AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS



Museum of Art, Cincinnati, Ohio

It Won't Be Long Now!

• Meet Fellow Members in Cincinnati Next Month at the ASHAE 62nd Annual Meeting

An official notice which will be mailed about December 15 will inform the membership that Pres. John E. Haines will open the 62nd Annual Meeting of the Society on Monday morning, January 23, 1956, in the Sheraton-Gibson Hotel, Cincinnati. Advance reservations indicate a fine gathering of members from all parts of the United States and Canada. Those who haven't already made their plans and reservations certainly should do so now. Remember January 23 is only a few weeks away.

From tea time Sunday afternoon at 3.00 p.m. until the close of the Annual Banquet on Wednesday evening, those attending will be well occupied with interesting, informative and enjoyable events planned to make this Annual Meeting a memorable occasion in the history of the Society and a credit to the Committee on Arrangements of the Cincinnati Chapter.

Members attending the technical sessions will find the 62nd Annual Meeting program made to order. The Program and Papers Committee has arranged for presentation of 16 papers, and in addition there will be two excellent symposiums. The one will deal with High Velocity Air Distribution, and the other is concerned with the very timely subject of Air Pollution. The 16 papers and two symposiums will be presented during eight sessions running Monday through Wednesday.

The business portion of the Annual Meeting will take place on Monday morning when President Haines opens the Meeting and calls for reports from the officers, the Council and the Committee on Research. The members will act on proposed By-Law amendments dealing with membership grades, the new regional plan of Chapter operations, a change in the terms of office of the Guide Committee, and a revision of the Nominating Committee procedure. The official notice of the Annual Meeting and the text of the proposed By-Law amendments will be found on p. 133. Every member is urged to vote, and the instructions accompanying the proxy ballot should be read carefully before casting a vote.

Special Events

The Welcome Luncheon in the Roof Garden of the Sheraton-Gibson on Monday is planned as the first big get-together. A. W. Edwards, general chairman of the 62nd Annual Meeting, will introduce the guest speaker F. W. Giesel, business manager of the Cincinnati Post. Mr. Giesel's subject is *Forward — A Look At Tomorrow.*

Fun in Kentucky is what it is called, and that is what the committee has planned for Monday evening. At 6:00 p.m. buses will leave from the Sheraton-Gibson transporting ASHAE members, their wives and

PROGRAM—62nd ANNUAL MEETING

American Society of Heating and Air-Conditioning Engineers

January 23-25, 1956—Sheraton-Gibson Hotel, Cincinnati, Ohio

Saturday — January 21

10:00 a.m. Executive Committee
1:30 p.m. Finance Committee
1:30 p.m. Public Relations Committee
2:30 p.m. Research Executive Committee
3:00 p.m. Chapter Relations Committee

Sunday — January 22

9:30 a.m. Council Meeting
10:00 a.m. Committee on Research
2:00 p.m. Committee Meetings
3-5 p.m. Reception and Tea

Monday — January 23

10:00 a.m. FIRST SESSION (*Ballroom*)
Call to Order — John E. Haines, President
Greetings by A. H. Gerdsen, President, Cincinnati Chapter
Report of President — John E. Haines
Report of Council — A. V. Hutchinson
Report of Treasurer — E. R. Queer
Report of Committee on Research — B. H. Jennings
Noise Production and Damping in Water Piping, by W. L. Rogers

12:15 p.m. WELCOME LUNCHEON (*Roof*)
Chairman: A. W. Edwards
Speaker: F. W. Giesel, Business Manager, Cincinnati Post
Subject: Forward — A Look at Tomorrow

1:00 p.m. CINERAMA HOLIDAY — Capitol Theater

2:00 p.m. SECOND SESSION (*Ballroom*)
Call to Order — John W. James, Vice President
Performance of Covered Hot Water Floor Panels, Part I — Thermal Characteristics, by E. L. Sartain and W. S. Harris
Thermal Design of Warm Water Ceiling Panels — A design Manual
Heat Gain Through Glass Skylight Fenestrations, by D. J. Vild and G. V. Parmelee

2:30 p.m. THIRD SESSION (*Roof*)
Call to Order — E. R. Queer, Treasurer
Moisture in Transient Heat Flow, by K. R. Solvason
Characteristics of Downward Jets from a Vertical Discharge Unit Heater, by S. M. Yen, Linn Helander and L. B. Knee
Resistance of Rectangular Divided-Flow Fittings, by L. G. Miller, C. H. Pesterfield and R. J. Waalkes

6:45 p.m. KENTUCKY PARTY at Beverly Hills Country Club
Buses leave Hotel from 6:00 to 6:15 p.m.

Tuesday — January 24

9:30 a.m. FOURTH SESSION (*Ballroom*)
Call to Order — John E. Haines, President
Amendments to By-Laws
Report of Inspectors of Election
John Everetts, Jr., Vice Chairman
Evaluation of Equipment Noise, by H. C. Hardy and D. E. Bishop
Electric Analogue Studies of Single Wall Sections, by Harry Buchberg
Electric Analogger Analysis of a Cooled Structure Complex, by C. F. Kayan

10:00 a.m. FIFTH SESSION (*Roof*)
Call to Order — John W. James, Vice President
M. K. Fahnestock, Vice Chairman
Index for Evaluating Heat Stress in Terms of Resulting Physiological Strains, by H. S. Belding and T. F. Hatch
Body Evaporation During Short Exposures to Various Temperatures, Humidities, Pressures and Mass Velocities, by J. W. McCutchan
Humidity Effects on the Odor Problem, by R. L. Kuehner

10:30 a.m. Ladies' City Trip and Luncheon
12:15 p.m. Life Members' Dutch Treat Luncheon
1:30 p.m. Chapters Conference Committee
1:30 p.m. Committee on Research
1:30 p.m. TAC on Air Cleaning, A. B. Algren, *Chairman*
1:30 p.m. TAC on Sorption, G. L. Simpson, *Chairman*
1:30 p.m. TAC on Thermal Circuits, S. F. Gilman, *Chairman*
1:30 p.m. TAC on Weather Data, John Everetts, Jr., *Chairman*
2:00 p.m. Inspection Trips: (1) Beckjord Station; (2) Striet-mann Biscuit Co.; (3) Terrace Plaza Hotel
7:00 p.m. Past Presidents' Dinner
7:30 p.m. Combined TAC's on Sensations of Comfort, Physiological Research, and Industrial Environment

Wednesday — January 25

9:30 a.m. SIXTH SESSION (*Ballroom*)
Call to Order — P. B. Gordon, Vice President
Elements of Dual-Duct Design and Performance, by N. S. Shataloff
Branch Fitting Performance at High Velocity, by C. M. Ashley, S. F. Gilman and R. A. Church
Self-Actuated Room Control from High Speed Air, by E. F. Snyder, Jr.

12:30 p.m. Ladies' Style Show and Luncheon

2:00 p.m. SEVENTH SESSION (*Ballroom*)
Call to Order — P. B. Gordon, Vice President
High Velocity Air Distribution Symposium
Duct Design — M. W. Wilson
Economics, Costs *vs.* Velocity — John Everetts, Jr.
Fan and Air Noises — R. D. Lemmerman
Duct Construction — K. A. J. Monier
Field Testing — R. D. Tutt
Pres. John E. Haines presiding
Report of Committee on Resolutions
Unfinished Business
New Business
Recess

2:00 p.m. EIGHTH SESSION (*Roof*)
Call to Order — John E. Haines, President
Air Pollution Symposium
C. H. Pesterfield, Vice Chairman
Health Aspects — Arthur Stern
Smog — Gordon Larsen
Regulations — Harry Ballman
Cleaning — J. W. May
Practical Approach — Charles Gruber
Enforcement — J. H. Carter

4:00 p.m. Nominating Committee Meeting
6:30 p.m. Social Hour
7:00 p.m. ANNUAL BANQUET (*Roof*)
Toastmaster: C. P. Krantz
Introductions and Installation of 1956 Officers
Presentation of Past President's Award to John E. Haines
Presentation of F. Paul Anderson Medal to R. W. Keeton, M.D.
Speaker: Rev. Lawrence Hall, British-American Humorist
Subject: Humor — America's Secret Weapon
Adjournment
Music for Dancing

Thursday — January 26

9:30 a.m. Council Meeting

Harriet E. Babcock Honored on 30th Anniversary with Society

Harriet Babcock on her 30th anniversary

Harriet Babcock accepts anniversary gift presented by A. V. Hutchinson, executive secretary

In tribute to her faithful service as a member of the ASHAE headquarters staff, Harriet E. Babcock was honored at a luncheon given on November 9, her 30th anniversary with the Society. The luncheon was held at the Arkwright Club in New York with the headquarters staff in attendance.

A. V. Hutchinson, executive secretary, presented Miss Babcock with a surprise gift from the Society, a gold watch which was appropriately inscribed with her years of service. Since Pres. John E. Haines was unable to be present, Mr. Hutchinson read a citation of the Council's appreciation of her service:

WHEREAS, Miss Harriet E. Babcock has completed thirty years of loyal and faithful service with the AMERICAN SOCIETY of HEATING AND AIR-CONDITIONING ENGINEERS, and

WHEREAS, she is held in the highest esteem by the Officers and Council for her devotion to duty in the Society's interest, and

WHEREAS, her friendly and cooperative spirit has been an inspiration to her associates in the headquarters staff and her keen sense of humor and her pleasing personality have endeared her to her many friends of ASHAE, therefore

BE IT RESOLVED that the Officers and Council extend sincerest congratulations to Miss Harriet E. Babcock and an expression of their full appreciation for her thirty years of service as a valued staff member, with every good wish for a continuation of this long and happy association with the Society.

Miss Babcock was radiant as she expressed her appreciation for the gracious tributes to her loyal service. In a letter to the staff she thanked her associates for their part in her celebration:

As well as enjoying the fun, I felt that the spirit of it was wonderful and I do not believe that it could be the same anywhere else. . . The nice things which were said I shall accept gratefully as a standard which I must try to live up to. . . It is true that our working hours comprise a large part of our lives and I thank you for making mine so happy.

Miss Babcock also paid a personal tribute to Mr. Hutchinson, Dorothy Mildner, and Anne O'Neil, who were with the Society when she joined the headquarters staff 30 years ago.

Now assistant to the executive secretary, Miss Babcock has worked in various capacities, in membership, publication and fund-raising. In previous years with the Society, she assisted First Vice Pres. John W. James, who was then technical secretary; Carl H. Flink, the present technical secretary; and the late Cyril Tasker, former director of research.

It Won't Be Long Now!

(*Continued from p.* 130)

friends to the Beverly Hills Country Club in Newport, Ky. The Cincinnati Chapter members speak highly of the food and entertainment, and are confident that everyone will have an enjoyable time.

On Tuesday afternoon there will be three inspection trips and members may sign up for these at the ASHAE Registration Desk. At 1:00 p.m. buses will leave for the new Beckjord Station of the Cincinnati Gas and Electric Co. This is a new power plant which should have a number of interesting features. At 2:00 p.m. there will be another bus tour to the Striet-mann Biscuit Co. plant to view the air conditioning and processing equipment. Also at 2:00 p.m. there will be a tour of the air conditioning and mechanical equipment installed in the Terrace Plaza Hotel, which is within walking distance of the Sheraton-Gibson.

The finale, of course, is the Annual Banquet, and this year is no exception. In addition to the installation of officers, presentation of the past president's award to President Haines and the F. Paul Anderson Medal to Dr. R. W. Keeton, Chicago, Ill., the committee has invited the British-American humorist, Rev. Lawrence Hall, to deliver the banquet address. His subject is *Humor — America's Secret Weapon.*

Ladies' Program

Monday afternoon at 1:00 p.m., Cinerama will be shown at the Capitol Theatre, and a block of seats has been reserved for ASHAE. Tuesday, the ladies will leave the hotel at 10:30 a.m. for a bus tour of the city, stopping off at the Art Museum prior to luncheon at the Hotel Alms. After lunch the tour will conclude with a visit to the famous Taft Museum.

As no program of ladies' events is complete without a fashion or style show, the committee has arranged with a leading department store, John Shillito Co., to present the latest fashions while the ladies are enjoying a luncheon at 12:30 p.m. Wednesday in the Cincinnati Club.

Annual Meeting Will Act on By-Law Changes

Notice of 62nd Annual Meeting and Message to ASHAE Members

Please take notice that the 62nd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS will take place in Cincinnati, Ohio at the Sheraton-Gibson Hotel, 9:30 a.m., Monday, January 23, 1956.

At the Semi-Annual Meeting of the Society, June 27, 1955 notice was given by President John E. Haines of amendments to the By-Laws proposed and endorsed by your Council. The subjects of these By-Law changes are listed as follows:

1. **Article II** on membership grades and the proposed amendments are in harmony with the recommendations of E.C.P.D.;

2. **Article III** outlining a plan for a Regional Plan for Chapter Operations;

3. **Article IV** on dues changes to conform to the revised membership grades;

4. **Article V** providing for seven Council members to serve as Regional Directors;

5. **Article VII** providing for a new Council Committee and a new General Committee to replace respectively the Chapter Relations Committee and the Chapters Conference Committee. A minor revision in the procedure of the Admission and Advancement Committee and a new term of office for the Guide Committee in order to increase its effectiveness;

6. **Article VIII** an increase in the number of alternates on the Nominating Committee and provision for payment of members transportation to two meetings instead of to one.

7. Elimination of **Appendix A** so that the list of Chapters within the regions can be adjusted by the Council when required to improve regional operations.

In the accompanying Appendix there is an explanation of the significant points of the proposed Regional Plan for Chapter Operations.

Members are urged to carefully study the proposed changes which are given in detail on the following pages so that they may cast their vote in favor of or against the changes at the time of receiving the proxy ballot.

John E. Haines
President

A. V. Hutchinson
Executive Secretary

December 15, 1955

Statement of By-Law Changes Submitted by Council

This Appendix is a complete statement of the proposal to amend the By-Laws as submitted by the Council at the Semi-Annual Meeting, San Francisco, June 27, 1955.

ARTICLE II
Memberships

That *Sections 1, 2* and *3(a)* be amended to read as follows:

Section 1. ***Grades.*** The grades of membership in the Society shall be designated as follows: (*a*) Honorary Members, (*b*) Presidential Members, (*c*) Life Members, (*d*) Fellows, (*e*) Members, (*f*) Associate Members, (*g*) Affiliates, and (*h*) Students.

Section 2. ***Construction.*** Whenever in these By-Laws the words "MEMBER" or "MEMBERS" appear in upper case letters (*sic*, "MEMBER," "MEMBERS"), they shall be taken to be synonymous with the terms "Honorary Members," "Presidential Members," "Life Members," "Fellows," and "Members;" and whenever the words "member" or "members" appear in lower case letters (*sic*, "member," "members") and the context permits it, they shall be taken to be synonymous with all the grades of membership in the Society.

Section 3. ***Qualifications.***

(*a*) *Honorary Members.* Any notable person of preeminent professional distinction may be elected an Honorary Member at an Annual Meeting of the Society.

That a new section, *Section 3(d)*, be added, reading as follows:

(*d*) *Fellows.* The grade of Fellow shall have an honorary status, which may be conferred upon a MEMBER of professional distinction but for which he may not apply. A MEMBER who has attained the age of forty-five (45) years, who has been in good standing as a MEMBER for a period of at least ten (10) years prior to the date of his proposal for Fellow grade, and who has attained unusual distinction in the arts relating to the sciences of heating, ventilating, cooling or air conditioning, or the allied arts and sciences, or in the teaching of a major course in said arts and sciences, or who by reason of invention, research, original work, or as an engineering executive on projects of unusual or important scope, has made substantial contributions to said arts and sciences, shall be eligible to become a Fellow. The grade of Fellow shall not be conferred upon more than ten (10) MEMBERS in any calendar year. The grade of Fellow shall not be conferred upon a member of Council during his term of office.

That existing *Section 3(d)* be renumbered as *Section 3(e)*, and that the first paragraph be amended to read as follows:

(*e*) *Members.* Any engineer or teacher of engineering having ten (10) years or more of experience of a character satisfactory to the Council in the arts relating to the sciences of heating, ventilating, cooling or air conditioning, or the allied arts and sciences, of which four (4) years or more shall have been in responsible charge of important engineering work or in the teaching of courses in said arts and sciences, shall be eligible to become a Member. Architects, chemists, physicians, scientists, and other persons deemed by the Council to be qualified by reason of special experience in the said arts and sciences, shall also be eligible to become Members.

That existing *Section 3(e)* be renumbered as *Section 3(f)*, and that said Section be amended to read as follows:

(*f*) *Associate Members.* Any person having graduated from a college or school of engineering with an engineering curriculum accredited by the Engineers' Council for Professional Development, or from a foreign engineering school maintaining similar standards, or from an engineering school of collegiate grade approved by the Council, or possessing eight (8) years of experience satisfactory to the Council in the arts relating to the sciences of heating, ventilating, cooling or air conditioning, or the allied arts and sciences, shall be eligible to become an Associate Member. Each successfully completed year in such college or school shall be deemed equivalent to one (1) year of such experience. Upon the adjournment of the meeting at which this by-law shall be adopted, all Junior Members shall be designated Associate Members.

That *Section 3(h)* be amended to read as follows:

(*h*) *Students.* Any person regularly enrolled as a graduate student or as an undergraduate student pursuing an engineering curriculum accredited by the Engineers' Council for Professional Development in a college or school of engineering, or in a foreign college or school of engineering maintaining similar standards, or in an engineering school of collegiate grade approved by the Council, shall be eligible for Student membership.

That *Sections 4, 5* and *6* be amended to read as follows:

Section 4. ***Privileges and Limitations.*** Honorary Members, Presidential Members, Life Members, and Fellows shall be entitled to all the rights and privileges of a MEMBER. Associate Members thirty (30) years of age or over shall be eligible to vote. Associate Members shall not hold elective office in the Society. Affiliates and Students shall not be eligible to vote or hold elective office in the Society. A student membership shall cease upon the student's graduation, or at the close of the school term during which his enrollment as a student has terminated. The Council may transfer a Student to Associate Member grade on proof of his qualifications therefor, or to Affiliate grade.

Section 5. ***Proposals and Applications.*** Proposals for Honorary membership or for Fellow grade shall be signed by ten (10) MEMBERS and by two-thirds of the members of the Council, and shall set forth resumes of the nominees' qualifications and attainments. Applications for membership in the Society or for advancement to higher grades shall be on written forms approved by the Council, setting forth resumes of the candidates' qualifications, experience and references, and such other pertinent data as the Council and the Committee on Admission and Advancement may require.

Section 6. ***Prerequisites.*** The affirmative vote of fifteen (15) members of the Council shall be required for the election of an Honorary Member, or the conferring of the Fellow grade. A two-thirds affirmative vote of the Council shall be required for the admission of a candidate to membership, or for advancement to a higher grade. No person, except a student, shall be admitted to membership or advanced to a higher grade unless his name shall have been published in an issue of the JOURNAL, or mailed to all members.

That the opening phrase of *Section 8(a)* be amended to read as follows:

(*a*) *Non-Payment of Dues*: If any Fellow, Member, Associate Member, or Affiliate shall fail to pay his dues by April 1, he shall be classed as delinquent and not entitled to vote; . . . . . .

ARTICLE III

That the heading be amended to read as follows:

Chapters, Special and Student Branches, and Regional Areas

That existing *Sections 1, 4* and *5* be renumbered as *Sections 1, 2* and *3*.

That a new *Section 4* be added reading as follows:

Section 4. ***Regional Areas.*** The Chapters and Branches of the Society in North America shall be divided by the Council into seven (7) geographical groups, and each group shall be designated a Regional Area. Delineation of Regional Areas, and changes therein, shall be published in an issue of the JOURNAL or mailed to all members.

That existing *Section 2* be renumbered as *Section 5*.

That existing *Section 3* be renumbered as *Section 6*, and that the following sentence be inserted in the seventh line of said section between the words "its proceedings" and "No contributions," to-wit:

Chapters and Branches shall file with the chairmen of their respective Chapters Regional Committees their recommendations concerning the policies, procedures and operation of the Society, its Chapters and Branches.

That existing *Section 6* be renumbered as *Section 7*.

ARTICLE IV

Funds

That in *Section 1* the word "Junior" be changed to "Associate."

That *Section 3* be amended to read as follows:

Section 3. ***Dues.*** Honorary Members, Presidential Members and Life Members shall be exempt from the payment of dues. The conferring of Fellow grade upon such members shall not affect such exemption. Unless changed by the Society at an Annual or Special Meeting, the annual dues of Fellows, Members, Associate Members thirty (30) years of age or over, and Affiliates, shall be twenty-five dollars ($25.00). The annual dues of Associate Members under thirty (30) years of age shall be fifteen dollars ($15.00). The annual dues of Students shall be fixed by the Council and shall be published in the JOURNAL.

That *Section 5* be amended to read as follows:

Section 5. ***Allocation of Dues for Research.*** Unless changed by the Society at an Annual or Special Meeting, forty percent (40%) of the dues received from Fellows, Members, Associate Members thirty (30) years of age or over, and Affiliates shall be allocated for basic or fundamental research in the principles and laws underlying matters in the arts relating to the sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences.

ARTICLE V

The Council

That *Section 1* be amended by adding to the first sentence the phrase "seven (7) of whom shall be from different Regional Areas and elected as Regional Directors for their respective Areas" and that *Section 2* be amended by inserting the words "Regional Areas" between the words "Branches" and "Officers" in Line 7.

ARTICLE VII

Committees

That *Section 2* be amended by adding a prefix thereto reading as follows: "Unless otherwise provided, the"

That a new subdivision (*e*) be added to *Section 2*, reading as follows:

(*e*) *Regions Central Committee,* consisting of the Second Vice President and the seven (7) Regional Directors. The said commit-

tee shall consider and report to the Council on the activities of Chapters and Branches, and make recommendations to the Council concerning the policies, procedures and operation of the Society, its Chapters and Branches; it shall coordinate the activities of the Chapters Regional Committees; and it shall investigate applications for the creation of Chapters and Branches, and report thereon to the Council. The Second Vice President shall be the chairman of said committee.

That *Section 3(a)* be amended to read as follows:

(*a*) *Admission and Advancement Committee*, consisting of three (3) MEMBERS in good standing as MEMBERS for at least ten (10) years and having at least three (3) years of service on the Council or on General Committees, which shall receive and consider applications for admission or advancement to Member, Associate or Affiliate grade, make diligent scrutiny and inquiry as to the character and qualifications of applicants, and report to the Council on the eligibility of each applicant for admission or advancement. The correspondence and proceedings of said committee shall be secret and confidential, and its correspondence concerning unsuccessful applicants shall be destroyed within a reasonable time.

That *Section 3(c)* be amended to read as follows:

(*c*) *Guide Committee*, consisting of nine (9) MEMBERS, to serve for a term of one (1) year commencing November 1. The said committee, in harmony with the editorial policies of the Society, shall compile the text section of THE GUIDE. The chairman of the Committee on Research shall be an ex-officio member of the said committee.

That *Section 3(f)* be amended to read as follows:

(*f*) *Chapters Regional Committees*, each serving one Regional Area, and each consisting of the Regional Director for the Area and one (1) member and one (1) alternate member selected by each Chapter therein, to serve for a term of one (1) year. The said committees shall solicit from the Chapters and Branches within their respective Regional Areas recommendations concerning the policies, procedures, and operation of the Society, its Chapters and Branches, review the same, and make recommendations thereon to the Regions Central Committee. Said committees shall select the MEMBERS and alternates to serve on the Nominating Committee, and duly notify the Executive Secretary of such selections. The alternate members of Chapters Regional Committees may be present at committee meetings and participate in the deliberations thereof, but shall not vote therein except in the absence of the committee members for whom they respectively are alternates. The said committees shall hold committee meetings prior to June 1 of each year. Each Regional Director shall be the chairman of the committee serving his Regional Area.

That *Section 3(g)* be eliminated, also Rules 1 and 2.

That *Section 5(c)* be amended by adding a prefix thereto reading as follows: "Except as otherwise provided,".

ARTICLE VIII
Meetings, Nominations, and Elections

That *Section 3* be amended to read as follows:

Section 3. ***Nominating Committee.*** The Nominating Committee, to serve for a term of one (1) year from the opening of the Annual Meeting, shall consist of eleven (11) MEMBERS and sixteen (16) alternate MEMBERS, all of whom shall have been in good standing as MEMBERS for a period of at least five (5) years. Four (4) members and one (1) first alternate and one (1) second alternate member of the said committee, each from a different Regional Area, shall be selected by the Council at or prior to its last quarter-annual meeting; and one (1) member and one (1) first and one (1) second alternate member shall be selected by each Chapters Regional Committee, and certified to the Executive Secretary by September 1 of each year. No member of the Council shall be eligible to serve on the Nominating Committee, and no Chapter shall be represented on the said committee by more than one (1) of the eleven (11) MEMBERS. The Nominating Committee so chosen shall effect its own organization during the Annual Meeting of the Society, and shall hold a meeting during the Semi-Annual Meeting of the Society. By September 1 of each year the Nominating Committee shall nominate candidates for the elective offices, the members of the Council and the Regional Directors to be elected at the ensuing Annual Meeting, and notify the Executive Secretary of the names of the nominees, the notice to be accompanied by the written acceptances of the candidates. Seven (7) members entitled to vote on the said committee shall constitute a quorum. No alternate member may be present at Committee meetings, nor shall he participate in the deliberations thereof or vote therein except in the absence of the member, or the member and the first alternate member of the one of the eight (8) groups with which he was selected. The transportation expenses, as defined by the Council, of eleven (11) Committee members who participate in the deliberations at the Annual and Semi-Annual meetings of said committee shall be included in the budget and defrayed by the Society.

BY-LAWS — APPENDIX A

That said Appendix A be eliminated.

Nuclear Engineering and Atomic Exposition

It has been announced that 26 engineering and scientific groups are sponsors of the Nuclear Engineering and Science Congress, held December 12-16 in the Public Auditorium, Cleveland. Nearly 300 papers on the general subject are included on the program.

Wisconsin Chapter Cooperates in Engineering Institutes

The program for the Air Conditioning Institute, held November 7-9, 1955, by the University Extension Division of the University of Wisconsin at Madison, includes some 15 papers on various subjects of current interest in air conditioning. The following members of the Society are scheduled for talks or for presentation of papers during the course of the Institute: D. W. Nelson, professor of mechanical engineering, The University of Wisconsin; J. R. Akerman, assistant professor at the university; L. O. Crooks, engineer, York Corp., Chicago, Ill.; W. W. Kennedy, manager, Air Distribution Development, Barber-Colman Co., Rockford, Ill.; R. D. Hoss, assistant supervisor of field training, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.; L. C. Plaehn, manager, Barber-Colman Co., Milwaukee, Wis.; H. W. Alyea, chief field engineer, Johnson Service Co., Milwaukee, Wis.; and L. F. Flagg, supervisor, commercial field training, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

BRAB Studies Hot-Water Heating Equipment Standards

As a project for the FHA, the Building Research Advisory Board has undertaken to prepare a study of criteria for performance standards for domestic hot-water heating equipment. The committee which will carry on the project will study existing data, define problems, and develop recommendations. Serving on this BRAB committee, along with other experts in the field, are the following Society members: E. H. Haugen, chief engineer, Timken Silent Automatic Division, Jackson, Mich.; John W. James, first vice president of ASHAE and vice president of research, McDonnell & Miller, Inc., Chicago, Ill.; D. W. Pray, research committee, *National Association of Plumbing Contractors*, and partner, Pray Bros., Wichita, Kans.; K. O. Schlentner, chairman, Institute of Boiler and Radiator Manufacturers, and manager, Htg. & A-C Engrg., National-U.S. Radiator Corp., Johnstown, Pa.; and Rutcher Skagerberg, director, Operations Engineering, Public Housing Administration, Washington, D.C.

Gausman & Moore Anniversary

The firm of Gausman & Moore, Inc., consulting engineers, St. Paul, Minn. is celebrating its 20th anniversary. C. E. Gausman, partner, has been a Member of the Society for 32 years.

Journal Section

DONOVAN JOINS GENERAL ELECTRIC

The resignation of D. T. Donovan, assistant secretary, effective November 30, 1955 has been announced by Pres. John E. Haines.

Mr. Donovan left the ASHAE Headquarters staff to assume a position with the General Electric Co. on December 1, as manual and data specialist in the commercial engineering section of the Home Heating and Cooling Department, Bloomfield, N. J.

David T. Donovan

As assistant secretary since December 1951, Mr. Donovan's responsibilities have included working with chapter officers, the Chapters Conference Committee, the Chapter Relations Committee, and in the editing and production of the TRANSACTIONS.

During the four years he has been with the Society Mr. Donovan has become quite well known to the members through his travels to chapter cities and attendance at the Annual and Semi-Annual Meetings.

Prior to joining the headquarters staff, Mr. Donovan was associated with Bethlehem Steel Co. at its Lackawanna plant, near Buffalo, N. Y. He majored in the engineering sciences at Harvard University, and was graduated in 1948 with a B.S. degree. He served three years in the Army in meteorology work as a weather observer. Born in Lafayette, Ind., Mr. Donovan and his family live in Ramsey, N. J.

Mr. Donovan has been a valued member of the ASHAE staff and takes up his new duties with the very best wishes of the Officers and Council for his future success.

ASHAE MEMBERS SPEAK AT BRI

The Building Research Institute conducted a meeting in Washington on December 7 and 8 devoted to the design for environment of multi-storied buildings.

The general chairman was John E. Haines, president of ASHAE, and the two speakers who covered the subject of air conditioning systems were C. P. Roberts, chief engineer, Voorhees, Walker, Smith & Smith, New York, N.Y. and also ASHAE Second Vice Pres. P. B. Gordon, Wolff & Munier, Inc., New York, N. Y. Both are members of ASHAE.

Laboratory Completes Calorimeter for Naval Research

An instrument called a human calorimeter has resulted from seven years of research by the Society for the U. S. Naval Medical Research Institute, Bethesda, Md. It is expected to shed new light on human temperature regulation, working efficiency, and metabolism in health and disease under a wide range of climatic conditions.

The Society's Technical Advisory Committee on Human Calorimetry, which has supervised the planning and development work on the calorimeter, recently witnessed a demonstration of the instrument at the Naval Medical Research Institute. Committee members present were Prof. G. L. Tuve, chairman, Prof. Nathaniel Glickman, J. D. Hardy, Prof. E. R. Queer, T. H. Urdahl, and Prof. C. P. Yaglou. Also present was ASHAE Director of Research E. R. Kaiser. Unable to attend were committee members R. S. Dill, vice chairman, and Dean L. E. Seeley.

Participating in the demonstration and explanation were Captain W. E. Kellum, Commanding Officer of the Institute, R. G. Huebscher, Dr. Charlotte Kitzinger, Commander David Minard, and Dr. T. H. Benzinger who is in charge of this research for the Navy.

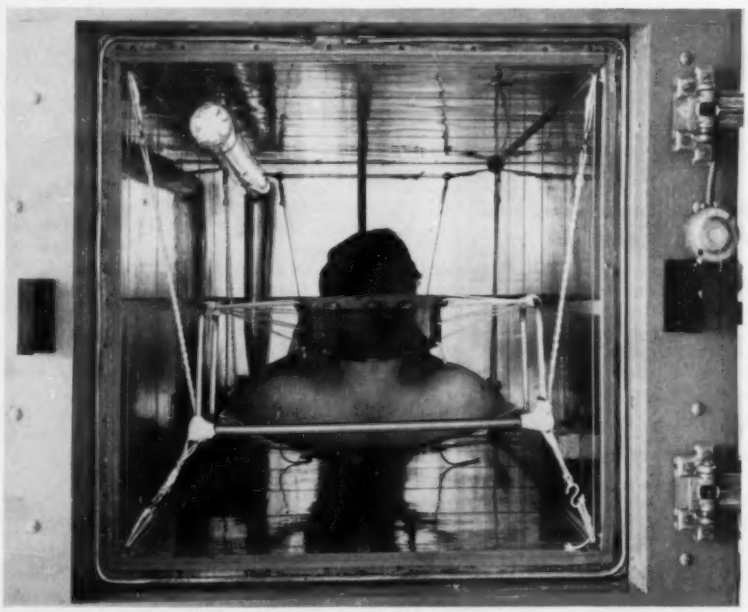
The new instrument utilizes the principle of gradient calorimetry obtaining faster response than conventional calorimeters. It also permits automatic measurement and continuous recording of total body heat output and also the amount lost by convection, by radiation and by evaporation. The gradient principle of calorimetry was set forth and experimentally verified on a baby-sized model in 1949 by T. H. Benzinger and C. Kitzinger of the Naval Research Institute.

Many engineering problems needed solution before an adult-size calorimeter could be completed. The design and construction of the larger instrument was carried out by R. G. Huebscher at the Society's Research Laboratory. The main chamber measures 7 ft long and is 32 in. square inside. This permits a person to perform various exercises while in the horizontal position. Together with its associated equipment, the calorimeter occupies a two-floor building at the Naval Medical Center in Bethesda, Md. where it was shipped from Cleveland.

Essential to its performance are the heat metering layers lining the inside of the main chamber as well as lining the separate systems for measuring heat losses to the air used for respiration and ventilation. A wide variety of experimental conditions for simulating tropical, desert, and arctic climates can be set in the chamber.

HEATH BECOMES EXEC V-P

W. R. Heath is the new executive vice president of the Buffalo Forge Co., Buffalo, N. Y. Mr. Heath is a long-time member of the Society. Announcement of his election comes from the directors of the company.



End view of new human calorimeter showing subject supported on a light metal frame suspended by nylon cords from corners of calorimeter. Tube at upper left introduces air at controlled temperature, humidity, and flow for ventilating the chamber. Heat metering layers covered by aluminum foil are seen lining the walls of the chamber.

Society Research Gains Widespread Acceptance

THERE are many advantages to cooperative research and more and more companies in heating, ventilating and air conditioning are realizing their significance. They find that by sponsoring or supporting basic research conducted by an impartial organization such as the Society, it is less costly, does not tie up company engineering personnel, and eventually contributes to the common good. Here is a typical example of how this idea works.

The manufacturers of fans, roof ventilators, compressors, motors, and duct systems have been seeking a method of noise measurement which will put noise control on a sound engineering basis. Recently ASHAE

announced it was beginning a research program covering these objectives. Promptly over 30 companies contributed funds supporting this project.

50% More Contributors

Another reason why there are 50 percent more companies and associations contributing today than 11 months ago is that the present Society Research Program includes over 20 projects of wide interest which in many instances single companies would find uneconomical to conduct on an individual basis. As each project is guided by an ASHAE Technical Advisory Committee comprised of members with experience and specialized knowledge of that particular subject, it is understandable that there now are 72 more contributors sponsoring Society Research.

Society Research Is Basic

The answers to many problems in heating, ventilating and air conditioning have been solved by the basic and fundamental research which ASHAE has been conducting in its own Research Laboratory and in cooperating institutions. As short a time ago as January 1947, the future plans of the then Committee on Research included a minimum annual budget of $75,000 and the prediction that large research plans already in operation would be expanded substantially as additional funds became available.

Demand Increasing

ASHAE Research evidently is considered a valuable source of earnestly needed information because this year's research budget of over $200,000 reflects confidence in the existing program and an ever increasing demand for the Society to initiate new research projects, and the 1956 budget contemplates an increase of more than 10 percent over this year.

It was over 60 years ago that the men with vision who formed the Society established as its primary ob-

jective the "advancement of the arts and sciences of heating, ventilating and air conditioning and the allied arts and sciences for the benefit of the general public."

In The Public Interest

There can be no question that one of the ways in which ASHAE is fulfilling this objective is through its dynamic Research Program. The Society is thus able to make available basic information helpful in providing the general public with the optimum in heating, ventilating and air conditioning.

Through the assistance of cooperative sponsorship and contributions this challenging responsibility will continue to increase, further justifying the Society aims and objectives so well established in 1895.

Honored by Life Membership

Roswell Farnham, Buffalo, N.Y. — Ever since he joined the Society in 1920, Roswell Farnham has had an active part in the affairs of the Society and of the Western New York Chapter. A long-time resident of Buffalo, he has been district manager of the Buffalo Forge Co. since 1916.

At present, Mr. Farnham is chairman of the Admission and Advancement Committee. He has been a member of that committee since 1951 and was chairman also in 1953. A member of Council from 1927-33, he was chairman of the Membership Committee during most of this period, 1928-29 and 1931-32 (member in 1930), and chairman of the Meetings Committee in 1933. In earlier years, he served on the Advisory Committee on International Heating and Ventilating Exposition, 1929-30, Committee on Rules of Award for F. Paul Anderson Medal, 1930, and Committee on Chapter Relations, 1931-32.

Roswell Farnham

Mr. Farnham has been a member of the board of governors of the Western New York Chapter almost continually since 1927. Previous to that time, he served as secretary of the chapter, 1921-25, and as its president in 1926. As president of the Western New York Chapter, Mr. Farnham took charge of the opening ceremonies of the Society's 32nd Annual Meeting held in Buffalo in 1926. For three years beginning in 1948, he was chosen as chapter delegate for the Chapters Conference Committee, and alternate in 1951.

After attending public schools in Buffalo, his birthplace, he went to the University of Vermont and received his B.S. in mechanical engineering in 1913. He became associated with Buffalo Forge Co. the year of his graduation and three years later became district manager of engineering sales with headquarters in Buffalo.

Besides his work with ASHAE, Mr. Farnham has served as president of the Air Conditioning Council of Western New York, *Engineering Society of Buffalo* and University Club of Buffalo. A registered professional engineer in the State of New York, he has been corresponding secretary and vice president of the Erie County Chapter of the *New York State Society of Professional Engineers*. He is a member of Sigma Phi, the Buffalo Athletic Club and Gyro Club of Buffalo.

Nils T. Sellman, Scarsdale, N.Y.— Completing a distinguished career in the gas and electric field, Nils T. Sellman retired last August from his position as assistant vice president of sales, Consolidated Edison Co. of New York, Inc. He has been a member of the Society since 1922.

Always closely associated with gas utilization and promotion, Mr. Sellman was active in the formation of the *AGA* testing laboratories when he was assistant secretary manager of that association in the early twenties. He was the first person to receive that association's Charles A. Munroe Award (now known as the *AGA* Distinguished Service Award) for his contributions to development and sales promotion in the gas appliance field.

Mr. Sellman, who was born in Sweden, received his M.E. from Stevens Institute of Technology in 1913 and joined the Consolidated Gas Co. later that year. His connection with the company was interrupted by a period of war service and later by several years of association with *AGA*. In the mid-twenties he returned to the company as engineer of utilization and was later named assistant secretary. Further assignments brought him more closely in contact with sales and utilization: From 1944 to 1948 he was vice president of the former Westchester Lighting and Yonkers Electric companies.

A professional engineer in the State of New York, Mr. Sellman is a member of *ASME*, the *Society of Gas Engineering*, the Engineers Club, and the Academy of Political Science. He was a director of *AGA* for 5 years and has been a member of the *Society of Gas Lighting* for 29 years. In addition, he belongs to many social organizations, civic societies and Swedish groups. Although retiring, he certainly will not lack for things to do. He plans to remain at his Scarsdale home and devote some time to travel.

N. T. Sellman

SPURLOCK ON FULBRIGHT AWARD TO BAGHDAD COLLEGE

Benjamin H. Spurlock, Jr., member of Council and professor of mechanical engineering, University of Colorado, Boulder, Colo., has been invited to lecture and serve as a consultant to the College of Engineering in Baghdad, Iraq, during the coming year under a Fulbright grant. Professor Spurlock was elected to two three-year Council terms, having served with that body since 1951.

The College of Engineering was founded in 1951 and has approximately 400 students. Along with the other schools of higher education in Baghdad, it will eventually become a part of the University of Baghdad. The school is under the ministry of education and is tuition free except that the students are required to serve the government for a like number of years after graduation.

Professor Spurlock has been invited by the State Department and the college to assist with the planning and development of the curricula and the laboratories of this recently-formed school. He will be one of seven receiving Fulbright awards assigned to Iraq, and the only one in engineering. Other fields represented include mathematics, physics, geology, medicine and chemistry.

Professor Spurlock joined the University of Colorado as an instructor in 1940 and was promoted to assistant professor in 1942. After a two-year interim as a visiting lecturer at Yale University, he returned to the University of Colorado in 1946, was named associate professor the following year and full professor in 1954.

He received his B.S. from Georgia Institute of Technology, S.M. from Massachusetts Institute of Technology, and M.E. from Colorado University, and has carried on extensive study and research at the University of California and Yale University.

Professor Spurlock joined the Society in 1944 and has been active in both Society and chapter affairs. He is presently a member of the TAC on Evaporative Cooling, the Committee to Codify Council Policies, the Finance and Chapter Relations Committees. An active member of Rocky Mountain Chapter, he served as its president in 1951. He was honorary chairman of the Society's 1953 Semi-Annual Meeting held in Denver.

He is a member of the board of directors of *ASRE* and regional director for their Rocky Mountain region. Also, he has served on *ASME* committees and has been a member of the editorial board of *ASEE*'s *Heat Power News*. Having written several articles, Professor Spurlock's name appears as author or co-author of technical papers in the JOURNAL and TRANSACTIONS.

Accompanying Professor Spurlock to Baghdad and the Middle East are Mrs. Spurlock and their two sons, Benjamin, III and Robert. They left Denver on October 15, arriving in Baghdad on October 18, after a short stopover in London.

Summary of Chapter Meetings*

SUCCESSFUL CHARTER MEETING HELD IN BATON ROUGE, LA., OCTOBER 19

Society members present at the well-attended charter meeting of the Baton Rouge Chapter on October 19, saw C. S. Woodruff installed as president by ASHAE First Vice Pres. John W. James, Chicago, Ill. The newly installed president then received the Chapter's charter from Vice President James, who later addressed the members, discussing air conditioning under the general title of *The Air We Breath.*

The officers installed with Mr. Woodruff are J. F. Naylor, Jr., vice president; A. J. Mayers, Jr., secretary; and A. W. Holland, treasurer.

Greetings and congratulations from the College of Engineering, Louisiana State University, were extended by Dean Leo J. Lassalle who commended the local engineers on the establishment of an ASHAE Chapter in Baton Rouge. He added that it would prove most beneficial to the city, the University and the area in general.

Another guest present was W. B Martin, Jr., president of the Delta Chapter of ASHAE, who presented Mr. Woodruff with an inscribed gavel on behalf of the Delta Chapter members, a number of whom attended the meeting.

The executive secretary of the Society, A. V. Hutchinson, New York. N. Y., presented Mr. Mayers, the Chapter secretary, with a set of record books and other material necessary for properly recording the activities of the Chapter.

In his talk on *The Air We Breath,* Vice President James said that, based on accumulated research information, people are healthier and more comfortable when they live and work under uniform indoor climatic conditions. He explained that this opinion has been indicated by sound basic facts which are a result of over 30 years of Society research on this subject, and then proceeded to illustrate several ways air conditioning contributes to health and comfort.

C. S. Woodruff, first president of Baton Rouge Chapter, receives charter from John W. James, first vice president of Society

He described how the discomfort of a tobacco-smoke filled room can be eased by the introduction of outside air through the air-conditioning system, how undesirable odors usually may be removed by the application of activated carbon in the system, and explained that virus infection may be lowered through introducing *glycol* into the system.

In conclusion, he pointed out that the Society research program at the ASHAE Research Laboratory in Cleveland, Ohio, and at cooperating institutions elsewhere, involves a yearly expense of about one quarter million dollars. He envisions still greater research achievement ahead.

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

• *BLUEGRASS*: At the October meeting, J. W. May introduced the guest speaker, John W. James, ASHAE first vice president. Mr. James, vice president of research, McDonnell & Miller, Inc., Chicago, Ill., entitled his talk *Does Air Conditioning Provide a Healthful Environment?*

In order to encourage increased membership, those present were asked to bring a friend to the next meeting. Pres. W. M. Pace presided.

• *BLUEGRASS*: Appointments of committee chairmen were announced in September as follows: *Membership*—K. P. Vinsel, Jr.; *Attendance*—E. C. Arenz; *Program*—W. J. Killian; *Entertainment*—E. W. Neel; and *Publicity*—R. F. Logsdon. The Chapter's affiliation with the Louisville Engineering and Scientific Societies' Council having been approved, H. L. Carr and K. J. Roy were appointed as representatives. Pres. W. M. Pace presided at this business meeting.

• *BRITISH COLUMBIA*: Methods of testing heating and ventilating equipment in British Columbia were outlined in October by Jack Breeze, head, Physics Division, National Research Council, University of British Columbia. S. C. Gale introduced the guest speaker who also predicted possible future facilities for testing devices using natural gas.

Thanks were extended by Pres. Cornelius Van Boeyen to the following members who had accepted their appointments to committee chairmanships: *Program*—R. B. McDonell; *Special Events*—E. E. Renouf; *Finance*—J. K. Walker; *Publicity*—R. G. MacDonald; *Attendance*—W. R. Course; and *Membership*—R. A. Malcolm.

A general report on the 1955 Semi-Annual Meeting was presented by President Van Boeyen, member, Chapters Conference Committee. Attendance 45. Attendance ratio 0.44.

• *CENTRAL NEW YORK*: Undivided attention was given to the speaker at the October meeting, L. J. LaTart, research associate, research and development laboratory, Revere Copper & Brass Inc., Rome, N.Y. Mr. LaTart, a member of the Central New York Chapter, was introduced by Past Pres. D. L. Mills and spoke on *The Practical Aspects of Snow Melting Application.* Slides were projected to illustrate some of the points, particularly with regard to the insulation of the heating surface. There was apparent interest in the topic, and the question and answer period was entered into by a generous

cross-section of those present. The questions continued to come from the floor, with the speaker providing ready answers and obviously enjoying his part, until Mr. LaTart himself had to call a halt to the questions due to the lateness of the hour.

Previous to Mr. LaTart's talk, Pres. F. D. Putnam installed the new officers and presented the gavel to the incoming president, L. A. Childs. Past Pres. C. R. Acheson presented Mr. Putnam with his past president's pin. Attendance 72. Attendance ratio 0.41.

• *CENTRAL OHIO*: As coffee speaker at the September meeting, J. D. Slemmons gave an interesting talk about his trip to the Society's 1955 Semi-Annual Meeting held in San Francisco in June. Pres. R. A. Wilson, presiding, outlined the Chapter's future meeting programs.

The main speaker, R. B. Breneman, branch manager, Armstrong Cork Co., Columbus, Ohio, delivered an enlightening talk on insulation. He demonstrated with slides showing methods of installation. Attendance 39.

• *DELTA*: A tour of inspection of the Louisiana State University Medical School Building was conducted previous to the September meeting. Upon completion of the tour, the members retired to the Engineer's Club where the meeting was held after dinner.

E. H. Sanford introduced Mr. Rance, engineer, Louisiana State University Medical School Building; A. R. Salzer, Jr., consulting mechanical engineer; and J. E. Leininger, consulting engineer, Joseph E. Leininger & Associates. Mr. Salzer and Mr. Leininger, both of New Orleans, spoke briefly on the design, application, and reasons for selection of the type system used in the building through which they had previously conducted the members.

On the business side of this meeting, Pres. W. B. Martin, Jr., requested a large attendance at the Baton Rouge Chapter charter meeting, and L. R. Maxwell, treasurer, thanked the members for having paid all their dues up to date. Reports were made by H. N. Stall, vice president; E. H. Sanford, technical papers chairman; H. L. Salaun, chairman, publicity committee; and J. S. Burke, member, Society Chapters Conference Committee. Attendance 63. Attendance ratio 0.42.

Cincinnati Chapter Officers: *l.* to *r. (seated)* A. H. Gerdsen, *president;* F. W. Wilson, *past president. (Standing)* E. A. Sobolewski, *board of governors;* C. P. Krantz, *treasurer;* R. G. Anderson, *vice president;* T. D. Reiley, *secretary*

• *EMPIRE STATE CAPITAL*: *Vibration and Noise Control for Air-Conditioning Equipment* was the subject discussed by the September guest speaker, D. H. Vance, vice president and executive engineer, The Korfund Co., Inc., Long Island City, N.Y. Demonstrating considerable knowledge of his subject, Mr. Vance presented an excellent picture of vibration and noise control of various types of control equipment in mechanical installations.

Pres. L. V. Appleby presided at the meeting. Attendance 28. Attendance ratio 0.32.

• *INLAND EMPIRE*: A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, was introduced by Max Tonn, chairman, program committee, at the September meeting. Mr. Hess, a member of Council, brought the chapter up to date on recent developments in the Society. He then gave an informative talk on *Panel Cooling*.

Pres. F. W. Jenkinson presided. Attendance 34. Attendance ratio 0.49.

• *KANSAS CITY*: At the meeting in October, Pres. A. S. Hurt, Jr., congratulated P. A. Moreno and his committee for the fine publicity in the *Kansas City Star*, and complimented Secy. S. C. McCann on the appearance of the recently distributed roster for 1955-56.

M. M. Harryman read a letter from Prof. Linn Helander, head, department of mechanical engineering, Kansas State College, requesting chapter support for a proposed college course in practical air-conditioning. A motion was carried unanimously referring this matter to the vocational guidance committee.

Pleasant and instructive entertainment was provided by Marsh Havenhill and F. C. Wilson, Kansas City Power and Light Co., who talked on the history of electric lighting and the effect of lighting on present-day air-conditioning loads. Mr. Wilson discussed the power factor as applied to air conditioning and the availability of both single and three-phase current for residential work. A tour of the Kansas City Power and Light Co. Building's recently installed air-conditioning plant concluded the meeting. Attendance 75. Attendance ratio 0.29.

Delta Chapter at their October meeting welcomed John W. James, Society first vice president, who gave a talk entitled *Does Air Conditioning Provide Healthful Indoor Environment.* Vice President James admires a citation of appreciation which was presented to him by W. B. Martin, Jr., chapter president

• *MEMPHIS*: A letter of appreciation from F. H. Kellogg, dean of engineering, University of Mississippi, expressing appreciation for a subscription to *Heating, Piping & Air Conditioning* was read at the September meeting. Secy. L. V. Eberle, Jr., advised the group that a copy of THE GUIDE 1955 had also been sent to Dean Kellogg.

J. S. Mitchell, Crane Co., Memphis, presented a film, *The Second 100 Years*, depicting the industry's growth in the past 100 years. Pres. John Hilton, II, appointed a publicity committee, consisting of J. G. Coleman, Jr., chairman, and H. A. Boudolf, for the October meeting. The chapter approved the continuance of this committee for the remainder of the year. Attendance 21. Attendance ratio 0.21.

Journal Section

• *MIAMI VALLEY*: At the first meeting of the 1955-56 season, presided over by Pres. D. E. Tullis, J. F. Eichelberger, director of research, Monsanto Chemical Co., St. Louis, Mo., was the guest speaker. Dr. Eichelberger's remarks dealt with the half-life of the plutanium element and its importance to atomic research. He proceeded to give a brief history of the research of radioactive materials, together with a visual and audible demonstration of some of the materials.

In the absence of R. J. Perkins, chairman of the committee for coordinating arrangements for the 1956 Annual Meeting, his report on the assistance to be given by the Miami Valley Chapter was read to the members. Attendance 52.

• *MINNESOTA*: Program Chairman E. T. Erickson introduced the October speaker, A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, Calif. He spoke on *High Temperature Water Heating Systems.*

Pres. J. S. Locke acknowledged receipt of thanks from the widow and son of the late W. F. Uhl for the flowers sent by the chapter. President Locke also read a letter of thanks from B. H. Jennings, chairman, Committee on Research, for the $1000.00 donation to the Society for the TAC on Air Cleaning for work to be done at the University of Minnesota. Attendance 154.

• *MISSISSIPPI*: Pres. J. E. Davis, Jr., presided at the September meeting of the Mississippi Chapter, when a motion was carried that meetings be eliminated during June, July and August.

B. L. Palmer introduced the speaker, S. N. Murphy, Stan Murphy Insurance Agency, who gave a talk on *Salesmanship and Selling.* Attendance 24.

• *NEBRASKA*: Pres. T. E. Davis presided at the October meeting. E. N. Seiler, program chairman, introduced Mr. Talsma, General Electric Co., Schenectady, N. Y., who spoke on atomic power for electricity. A film explaining the fundamentals of atomic energy was also shown. Attendance 31.

• *NORTH JERSEY*: *Acoustics and the Air-Conditioning Industry* was the topic discussed by M. W. Rees, technical adviser, Owens-Corning Fiberglas Corp., Toledo, Ohio, at the October meeting. An extensive question and answer period followed.

Pres. C. H. Smith, alternate member, Chapters Conference Committee, reported on the meeting of that committee held during the 1955 Semi-Annual Meeting.

• *NORTHEASTERN OKLAHOMA*: Secy. G. A. McCune introduced the members and guests at the October meeting. R. F. Shoemaker, who presided, announced the appointment of a nominating committee, consisting of W. C. Roads, R. L. Sigler and R. F. Shoemaker, and an auditing committee, staffed by J. C. Netherton, J. D. Shaw and R. E. Pauling.

New Trends in Package Boilers was the subject of the guest speaker, Mr. Furman, Orr & Sembower, Inc., Reading, Pa. The subject matter proved to be highly interesting. Attendance 17.

• *NORTHERN OHIO*: Past experiences of his consulting engineering practice were discussed by S. R. Lewis, consulting engineer, Chicago, at the October meeting. Mr. Lewis, a past president of the Society, was introduced by another past president, Lester T. Avery.

H. R. Canoyer and J. A. White were elected as member and alternate member, respectively, of the Chapters Conference Committee.

Mr. Canoyer, on behalf of the chapter, presented D. E. Mannen with a certificate of appreciation for his work as chapter president in 1954-55. Attendance 72.

• *ONTARIO*: An *exchange of ideas* between John W. James, Society first vice president, Chicago, Ill., and the Ontario Chapter members at the October meeting proved to be inspiring. Vice President James spoke on the *Health Aspect of Air Conditioning.* His look into the future of the industry and the Society's part in the advancement of the arts in which the membership is engaged was encouraging and instructive.

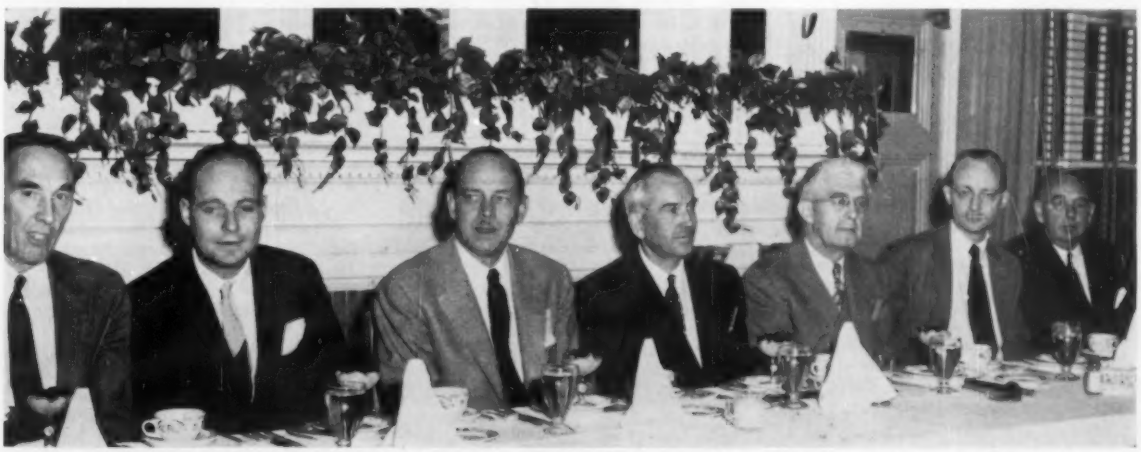
Pres. D. L. Angus called upon F. H. Goddard to introduce the new members. Since the last meeting, 34 members were added to the membership list.

A minute of silence was observed in memory of one of the chapter's very popular members, the late R. I. Dennis. Attendance 119.

• *OREGON*: A coffee talk given in September by R. C. Chewning, member, ASHAE Committee on Research, provided an enlightening description of the Society's current research program. Mr. Chewning also pointed out the future benefits to the industry of recent research developments.

Following a short recess, Vice Pres. W. R. Norte introduced the main speaker of the evening, A. J. Hess, president, Hess-Greiner & Polland, Los Angeles. His topic was *Air Conditioning a Phytotron.* Mr. Hess stressed numerous findings at the plant-growing laboratory at the California Institute of Technology, explaining that many of these have had far-reaching effects on agriculture in various parts of the world.

Reports by committee chairmen concluded the meeting, which was presided over by Pres. Dick Blankenship. Attendance 62. Attendance ratio 0.32.



Massachusetts Chapter played host at their October meeting to John E. Haines, Society president, who addressed the group on *The Next Ten Years.* Chapter officers shown dining with the guest speaker are *(l. to r.)* G. W. Sprague, member of the board of governors; W. G. Martin, Jr., vice president and program chairman; ASHAE President Haines; G. Donald Fife, chapter president; E. L. Blair, treasurer; R. F. Curry, secretary; and M. I. Kishler, member of the board of governors

Journal Section

• *PHILADELPHIA*: P. H. Yeoman, program chairman, introduced the guest speaker at the October meeting, C. B. Hershey, adviser, School Plant Division, Department of Public Instruction, Commonwealth of Pennsylvania. Mr. Hershey talked on the *Mechanical Phases of School Construction in Pennsylvania.* Pres. A. M. Robertson presided. Attendance 231. Attendance ratio 0.45.

• *ROCKY MOUNTAIN*: At a joint *ASME-ASRE*-ASHAE meeting in October, Pres. L. L. DeLong welcomed the members and guests and expressed his gratitude for the excellent attendance.

Richard Stewart of *ASME* introduced Prof. William Parks of the faculty of Denver University. Professor Parks briefly presented some of the principal features of the Engineering Unity program.

Mr. Stewart then introduced B. H. Spurlock, Jr., professor of mechanical engineering, University of Colorado, Boulder, Colo., who gave an illustrated talk on *Psychrometric Analysis for Design of Forced Draft Air Cooling Towers,* from a paper presented at the 1955 Semi-Annual Meeting of which Prof. Spurlock was co-author. Professor Spurlock pointed out that by means of a nomograph it is now relatively easy for engineers to select the most economical design of forced draft cooling towers without long and laborious calculations. He also noted that there is an increasing demand for and use of nomographs and other short-cut methods as an aid to engineers and designers.

At the conclusion of the talk, President DeLong presented Professor Spurlock with a leather pocket secretary as a going-away gift from the officers and members of the Rocky Mountain Chapter, since he was leaving to spend a year as a guest professor of mechanical engineering in Baghdad, Iraq. Attendance 90.

• *ST. LOUIS*: The golf trophy, won by the St. Louis Chapter at the 1955 Semi-Annual Meeting, was unveiled by Pres. E. T. Clucas at the chapter meeting in September. G. W. F. Myers, a past president of the chapter, was given much of the credit for the Chapter's success and made a few remarks apropos of the winning of the cup.

W. P. Norris, program chairman, introduced Mr. Linhart, Wagner Electric Corp., St. Louis, who spoke on the application and use of certain types of motors for heating and air conditioning.

President Clucas called on all members and guests to join in one minute of silent prayer as a tribute to C. R. Davis, who died this past summer. Attendance 51.

• *SOUTHERN PIEDMONT*: At the first fall meeting in September, J. A. Rice presented the speaker, James Sheehan, vice president of sales, Piedmont Natural Gas Co., Charlotte, N.C. Mr. Sheehan talked about the status of natural gas in the Carolinas and its future potential in this area.

Reports were given by R. O. McGary, chairman, membership committee; G. N. Payne, Jr., treasurer; and J. A. Rice, chairman, Roaring Gap summer outing. It was announced that Pres. L. F. Lawrence had presented a check for $250.00 to Prof. L. L. Vaughan during the summer outing as a contribution toward the L. L. Vaughan Fellowship at North Carolina State College. Two gracious letters of thanks were received from the North Carolina Engineering Foundation. Attendance 24.

• *TOLEDO*: Society President John E. Haines, Minneapolis, Minn., gave an optimistic forecast on *The Next Ten Years* at the October meeting. D. L. Wilson, program chairman, introduced President Haines.

F. C. Richardson, Jr., covered the problem of an ASHAE course at Toledo University sponsored by the Toledo Chapter. A motion inaugurating the course was carried. Pres. C. F. Hoffman appointed a committee, consisting of Robert Greenwald, chairman, E. H. Roper, P. J. Boes, R. C. Moorhead and W. D. McKitrick to take any necessary action in this connection. Attendance 40.

• *VIRGINIA*: *Automobile Air Conditioning*—1955 was the subject of the September guest speaker, D. C. McCoy, General Sales, Frigidaire Division, General Motors Corp., Dayton, Ohio. Mr. McCoy covered the problems of applying air conditioning to the automobile and how these have been solved.

Pres. T. B. Carpenter appointed two new committee chairmen: *Membership*—C. G. Conaway, Jr.; and *Attendance*—A. B. Miller. Attendance 26.

• *WEST TEXAS*: V. B. Garry introduced the October guest speaker, G. F. Landgraf, vice president, engineering, Trion, Inc., McKees Rocks, Pa. Mr. Landgraf gave a learned talk on measurement of air contamination.

Pres. R. B. Carow, who presided, reported on technical advisory committee activities. Attendance 19.

• *WESTERN MASSACHUSETTS*: At the first meeting of the 1955-56 season assembled at the Ivy House in West Springfield in September, Secy. F. A. Ferraro gave a report of the charter meeting held on June 2.

Pres. R. E. Cross listed the following committee chairmen: *Program*—J. E. Reed; *Attendance and Reception*—C. R. Munn; *Auditing and Finance*—J. P. Carey; *Publicity*—P. E. Taylor; *Technical*—F. C. McClean; and *Nominating*—C. E. Scott.

The speaker for the evening was H. E. Voegeli, development engineer, The American Brass Co., Waterbury, Conn. He discussed *Stored Solar Heat and the Heat Pump,* describing existing heat pump systems and experimental solar heat equipment and research. Mr. Voegeli was introduced to the chapter by T. C. O'Connor. Upon completion of the presentation a lively discussion period was held. Attendance 25. Attendance ratio 0.48.

• *WISCONSIN*: The program chairman, H. K. Forfar, introduced the speaker at the September meeting, W. W. Kennedy. Mr. Kennedy discussed high velocity air distribution and the special equipment required for the proper distribution of air in such systems.

The treasurer, H. W. Alyea, reported that he was momentarily *over-burdened* with cash, and without books and current bills. Result: *surplus.*

J. E. Peterson, publicity chairman, announced that a chapter newsletter is being initiated and appealed for support with a request for personal news items.

Pres. I. J. Rossiter announced that the Wisconsin Chapter had been requested to provide speakers for an institute on heating and ventilating presented by the Wisconsin School Administrators. President Rossiter also announced that, in accordance with a request from the Board of Registration, he had appointed a committee to study and make recommendations on Bill No. 688A, pertaining to the Registration Act. This committee, which was appointed during the summer, consisted of R. D. Rodwell, chairman, J. A. Lofte, W. T. Holland, H. D. Cook and L. C. Plaehn. Its proposal was read by Mr. Plaehn and supported by an assenting vote of the chapter. Attendance 88. Attendance ratio 0.37.

STUDENT BRANCHES

• *NORTH CAROLINA STATE COLLEGE*: Pres. R. E. Crawford, presiding at the September meeting, noted that plans were in progress for the contacting of graduates who might give information on job possibilities and salaries in order to assist students who will be graduated next spring.

Plans were outlined for the meetings of the coming year. R. W. McDonald, vice president, mentioned several films which might be obtained. Possible inspection trips were also discussed. Attendance 10.

• *UNIVERSITY OF DETROIT*: Pres. L. J. Hayes introduced the officers for the coming year at the September meeting. They were as follows: *President*—L. J. Hayes, Jr.; *Vice President*—V. W. Wiktorowski; *Secretary Treasurer*—E. F. Hoelscher, Jr.; and *Reporter*—R. T. Cronin.

The guest speaker for the evening was G. H. Williams, sales engineer, Carrier Corp., Detroit, Mich., and student branch committee chairman of the Michigan Chapter. Mr. Williams gave a brief history and resume of the activities of the chapter. He offered his services to the student branch in obtaining speakers and arranging tours. Attendance 11. Attendance ratio 0.91.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 96 applications for membership, including 20 students, 5 reinstatements; in addition 21 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by December 30, 1955, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Arizona

WARDLE, R. L., Engr., Kircher Asbestos & Rubber Co., Phoenix. REFERENCES: E. P. Boothroyd, E. B. Brooks, J. C. Turner, J. J. Vargo.

Arkansas

△COMBS, R. H., Supvsr., Air Cond., Arkansas Louisiana Gas Co., Little Rock. REFERENCES: B. R. Anderson, R. E. Blaylock, C. H. Miller, D. M. Mills.

California

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BRAND, WILLIAM, Sales Engr., Westinghouse Electric Corp., Sturtevant Div., Los Angeles. REFERENCES: Joshua Kheel, C. D. La Gasse, T. A. Marshall, R. W. Sigmund.

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JORGENSEN, R. H., Appl. Engr., Sterling Electric Motors, Los Angeles. REFERENCES: Tom Cotton*, J. L. McCullough, V. W. Sharpe, R. W. Thomas.

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YACKEY, H. H., JR., Engr., Carrier Corp., Los Angeles. REFERENCES: D. M. Abel*, F. W. Hutchinson, A. R. Oppenheim*, R. H. Phillips.

Colorado

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Connecticut

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Kansas

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Kentucky

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Louisiana

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Michigan

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Minnesota

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Oregon

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Texas

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Virginia

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Washington

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Italy

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ROMANCHIK, M. J.
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PORTER, J. M.

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MEADOR, H. T.
RAYL, S. C.
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OBITUARIES

W. G. SEYFANG, BUFFALO PUBLIC WORKS COMMISSIONER, DEAD AT 70

William G. Seyfang, commissioner of public works, City of Buffalo, N.Y., died in Buffalo's Millard Fillmore Hospital on November 1, following several months illness. He had undergone surgery twice, in April and June, and was hospitalized again on October 19, the eve of his 70th birthday. Mr. Seyfang was a member of the Society since 1939.

As public works chief, Mr. Seyfang took a keen interest in all projects, following their progress step by step. He supervised operations of the Engineering Division, Water Division and Buildings Division, overseeing such programs as street resurfacing, extension of the city's water-distribution system and maintenance and construction of municipal buildings.

Mr. Seyfang was the third Republican in recent years to be appointed by a Democratic mayor. One of these two predecessors was the late Louis A. Harding, a past president of the Society. His appointment as public works head capped an engineering career that had touched every phase of engineering and contracting work.

Born in Buffalo, Mr. Seyfang was graduated from Masten Park High School there. He attended Cornell University, receiving a mechanical engineering degree in 1909. After graduation, he went to New York and became an assistant engineer for Westinghouse, Church, Kerr & Co.

Four years later, Mr. Seyfang returned to Buffalo with Robert H. Tifft, a Cornell classmate and a New York engineering colleague. In 1916 they started the Tifft Construction Co. As executive vice president of the company, Mr. Seyfang was engaged in construction work all over the country, including forty-five stores for W. T. Grant Co. and plants for the Fleischmann Malting Co. Their projects also included schools, railroad bridges, a lift bridge for the N.Y. State Barge Canal, and the Millard Fillmore Hospital.

When the Tifft Construction Co. was dissolved in 1933, Mr. Seyfang joined the Fleischmann Malting Co., Chicago, as chief engineer. In 1937 he returned to Buffalo as co-ordinator for the City of Buffalo of all city contracts with the Works Progress Administration and worked under his old friend, Mr. Harding, then public works commissioner. Following a year is this connection, he was appointed managing engineer, Division of Plant, Board of Education, a position which he held until his appointment as commissioner.

Mr. Seyfang was a member of *ASME*, *American Society of Civil Engineers*, and the Professional Engineers of New York State. He also held membership in the Buffalo Club, Buffalo Athletic Club, Rotary, the Gyro and Aero Clubs and the Cornell Club. He was a bachelor.

ROGER W. BOOTH
Colorado Springs, Colo.

Roger W. Booth, 39, president, Heating, Inc., Colorado Springs, Colo., died recently in an automobile accident. He had been a member of the Society since 1945.

Journal Section

Mr. Booth, who was born in Marshalltown, Ia., on October 15, 1915, received his B.S. in general engineering from Iowa State College in 1937. He started his career as assistant to the president, Booth Brokerage Co., Marshalltown. In 1940, he joined Letts-Fletcher Co., also of Marshalltown, as an engineering consultant. He became an instructor of electrical engineering at Iowa State College in 1942. After two years of teaching, he was named chief engineer of the Lennox Furnace Co., Marshalltown, and remained with them until late in 1949, when he joined Heating, Inc.

While in Iowa, he was active in *AGA* and *GAMA*. He served as chairman of *GAMA's* Gas Furnace Group and as a member of the Coal Commercial Standards Committee of the National Bureau of Standards.

Mr. Booth is survived by his widow.

GEORGE H. DAHLQUIST
Chicago, Ill.

The Society has received word of the death of George H. Dahlquist, 57, on September 8, 1955. He was president of Modern Heating Engineers, Inc., Chicago.

Born in Chicago on April 4, 1898, Mr. Dahlquist worked for Warren Webster & Co. from 1917-19. In the years following, he was connected with various contractors. From 1924 until the time of his death, he was engaged as a heating, ventilating and air-conditioning contractor.

Surviving are his widow, Lillian; a son, William; his mother, Ellen; a brother, and two grandchildren.

RODERICK I. DENNIS
Toronto, Ontario

The victim of an unfortunate automobile accident, Roderick I. Dennis, Ontario Chapter member, died on September 15, 1955, at the age of 45.

Mr. Dennis was born on July 12, 1910 in Brantford, Ont. He joined the Standard Sanitary & Dominion Radiator Co., Ltd., Toronto, Ont., in 1928 and was still with that company as a sales representative at the time of his death.

He made his home in Port Credit, Ont., where he is survived by his widow.

CHARLES H. JACKSON
Milwaukee, Wis.

Following an illness of several months, Charles H. Jackson, 82, president and treasurer, Blower Application Co., Milwaukee, Wis., died on August 6, 1955. Mr. Jackson, a member of the Society since 1923, had been honored by Life Membership in 1943.

He was born in Waukegan, Ill., on May 2, 1873. In early years, he did design and construction work in that city. He also was connected with American Maize Products Co., Roby, Ind., Worthing Bassler Co. and Buffalo Forge Co., Chicago. In 1913, Mr. Jackson joined Bayley Manufacturing Co., Milwaukee, Wis., and remained in Milwaukee with Bayley Blower Co. In his connection with Blower Application Co., he served as vice president, previous to gaining the presidency.

Mr. Jackson was a 32nd degree Mason. He is survived by a daughter, Mrs. William J. Janssen, Fox Point, Wis., and a brother, George, of Waukegan.

JOHN W. JUNGELS
Chicago, Ill.

One of the Society members, John W. Jungels, Chicago, died in the fateful airline crash outside Denver, Colo., on November 1. Mr. Jungels, 57, was associated with C. A. Dunham Co., Chicago, as an engineer in their sales department.

Mr. Jungels was born in Aurora, Ill., which was his residence at the time of his death. He started with C. A. Dunham Co. in 1929 as a service engineer and later became manager of the differential heating and service departments. He joined the Society in 1947.

Survivors are a daughter, Virginia, and three brothers, George S., Henry E., and Albert E.

ARTHUR L. PISTOR
Montebello, Calif.

Arthur L. Pistor, engineer, Horsley Co., Montebello, Calif., died recently at the age of 52.

Mr. Pistor was born in Tucson, Ariz., on March 1, 1902. He studied at the University of Southern California and the University of California, receiving an A.B. from the latter in 1933. He also held a teaching certificate from the University of Arizona.

As a mechanical engineer in the 1940's, he was connected with M. M. Sundt Construction Co., Tucson; and Headman, Ferguson and Carrollo, Phoenix, Ariz. He entered a partnership as a consulting engineer in 1950, first as Sawyer and Pistor, and later as Milligan, Sawyer and Pistor. Beginning in 1952, Mr. Pistor worked for some time as a consulting engineer with a business of his own.

Mr. Pistor moved to Long Beach, Calif., last year. His widow, Mildred A. Pistor, survives.

ROBERT E. STUFF
Milwaukee, Wis.

Robert E. Stuff, Wisconsin Chapter member, died recently. Mr. Stuff, a heating engineer, was installation and service manager for the Wisconsin Ice & Coal Co., Milwaukee, Wis., since 1948.

His birthplace was Cedar Rapids, Ia., on July 25, 1917. Previous to joining the Wisconsin Ice & Coal Co., he had been connected with Home Coal Co. and Automatic Products Co., Detroit, Mich.

He is survived by his wife, Dorothy L. Stuff.

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Nominating: B. L. Evans, St. Louis, Chairman; W. O. Stewart, Los Angeles, Secretary; F. W. Brundage, Kalamazoo; E. L. Crosby, Baltimore; W. J. Collins, Jr., Oklahoma City; J. D. Kroeker, Portland, Ore.; A. B. Newton, Wichita, Kans.; W. B. Pennock, Ottawa, Ont.; J. D. Siemmons, Columbus, Ohio; R. L. Stinard, New York; G. D. Winans, Detroit. Alternates: W. G. Hole, Montreal, Que.; G. A. Linskie, Dallas.

ASHAE — OFFICERS OF CHAPTERS AND BRANCHES

(61 Chapters: 1 Special Branch: 6 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

ARIZONA

Arizona: 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES, W. A. Biddle, 3817 N. 15th Ave. SECY, E. P. Maxwell, 39 W. Adams St.

ARKANSAS

Arkansas: 1952. Hdqrs., Little Rock. Meets, 3rd Tues. PRES, J. L. Brown, 212 Terminal Warehouse Bldg. SECY, H. H. Himstedt, 510 E. Third St.

CALIFORNIA

Golden Gate: 1937. Hdqrs., San Francisco. Meets, 1st Thurs. PRES, D. E. McLeod, 2415 Green St. (23). SECY, Herb Duncan, 938 N. Linden Ave., South San Francisco.

Sacramento Valley: 1952. Hdqrs., Sacramento. Meets, 1st Wed. PRES, R. A. Sarro, 5412 Argo Way (21). SECY, M. J. Delavan, 405 Meister Way (19).

Southern California: 1930. Hdqrs., Los Angeles. Meets, 1st Tues. PRES, J. L. McCullough, 1978 S. Los Angeles St. (11). SECY, W. J. Bigger, 6620 Telegraph Rd. (22).

COLORADO

Rocky Mountain: 1944. Hdqrs., Denver. Meets, 1st Wed. PRES, L. L. DeLong, 2027 S. Washington St. (10). SECY, W. V. Burbank, P.O. Box 840.

CONNECTICUT

Connecticut: 1940. Hdqrs., New Haven. Meets, 3rd Thurs. PRES, E. J. Hoagland, 257 Whitney St., Hartford. SECY, J. D. Pierce, 775 Capitol Ave., Hartford.

DISTRICT OF COLUMBIA

Washington: 1935. Hdqrs., Washington. Meets, 2nd Wed. PRES, W. C. Reamy, Jr., 720 Mills Bldg. (6). SECY, S. H. Robbins, Jr., 2117 M Street, N.W. (7).

GEORGIA

Atlanta: 1937. Hdqrs., Atlanta. Meets, 2nd Mon. PRES, T. A. Barrow, Jr., 302 Ponce de Leon Ave., N.E. (8). SECY, J. A. Marshall, 1415 Howell Mill Rd., N.W.

ILLINOIS

Illinois: 1906. Hdqrs., Chicago. Meets, 2nd Mon. PRES, G. G. Freyder, 72 W. Adams St. (90). SECY, Herbert Kreisman, 117 N. Desplaines St. (6).

INDIANA

Indiana: 1943. Hdqrs., Indianapolis. Meets, 4th Tues. PRES, J. W. Jackson, 1531 N. Pennsylvania St. (2). SECY, G. W. Vogel, 31 E. Georgia St. (4).

IOWA

Iowa: 1940. Hdqrs., Des Moines. Meets, 2nd Tues. PRES, G. J. Kraai, 907 Sixth Ave. (14). SECY, W. A. Schworm, Physical Plant Dept., Iowa State College, Ames.

KANSAS

Kansas: 1951. Hdqrs., Wichita. Meets, Tues. after 1st Mon. PRES, A. S. Hurt, Jr., 3601 E. 18th St. (27). SECY, T. L. Roberts, 2008 S. Parkwood Lane (18).

KENTUCKY

Bluegrass: 1954. Hdqrs., Louisville. Meets, 2nd Mon. PRES, W. M. Pace, 218 Don Allen Rd. (7). SECY, R. B. Duggan, 41 Beechwood Rd., Jeffersonville, Ind.

LOUISIANA

Baton Rouge: 1955. Hdqrs., Baton Rouge. Meets, 3rd Wed. PRES, C. S. Woodruff, P.O. Box 358. SECY, A. J. Mayers, Jr., 7732 Goodwood Ave.

Delta: 1939. Hdqrs., New Orleans. Meets, 3rd Tues. PRES, W. B. Martin, Jr., 635 Commercial Pl. (12). SECY, R. K. Goode, 3613 Pine St. (25).

Shreveport: 1948. Hdqrs., Shreveport. Meets, 3rd Thurs. PRES, R. S. Segall, 848 River Rd. SECY, A. L. Jones, Jr., 753 Gladstone.

MARYLAND

Baltimore: 1949. Hdqrs., Baltimore. Meets, 3rd Wed. PRES, E. J. Morris, 813 N. Calvert St. (2). SECY, E. J. Dull, 1122 N. Charles St. (1).

MASSACHUSETTS

Massachusetts: 1912. Hdqrs., Boston. Meets, 3rd Tues. PRES, G. D. Fife, 79 Milk St. SECY, R. F. Curry, 80 Ripley St., Newton Centre (59).

Western Massachusetts: 1955. Hdqrs., Springfield. PRES, R. E. Cross, 114 Boston Rd. SECY, F. A. Ferraro, 172 Chestnut St.

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, D. S. Falk, 4864 Woodward Ave. (1). SECY, J. H. Spitzley, 1200 W. Fort St. (26).

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, S. M. Pagan.elli, 47 N. Division Ave. SECY, B. J. Walter, 333 Fuller Ave., N.E.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, J. S. Locke, 2753 Fourth Ave., S. (8). SECY, F. G. Vogt, 6530 W. Lake St. (16).

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, B. L. Palmer, 1808 N. Mill St. (2). SECY, M. F. Knipp, Jr., 2858 Arbor Hill Dr. (4).

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, A. S. Hurt, Jr., 2119 Washington St. (5). SECY, S. C. McCann, 210 W. Tenth St. (5).

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, E. T. Clucas, 4354 Olive St. SECY, N. J. Hunbuch, Jr., 7020 Cornell, University City (5).

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, T. E. Davis, 4303 Dodge St. SECY, C. A. Failer, 1802 Mason St. (2).

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, C. H. Smith, 2300 N. Stiles St., Linden. SECY, M. C. Christesen, 196 Everett Pl., Englewood.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Mon. PRES, H. F. Munn, 419 Granite, N.W. SECY, J. K. James, 4462 Avenida del Sol.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, F. D. Putnam, 115 Pulsifer Dr., Auburn. SECY, Merle Weninger, 230 Goodrich Ave. (5).

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, L. V. Appleby, N. Pearl & Van Woert Sts. (4). SECY, E. J. Mahoney, 45 Colvin Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, Albert Giannini, 385 Madison Ave. (17). SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, C. W. Kaupp, 271 Delaware Ave. (2). SECY, J. P. Guerra, 34 E. Depew Ave. (14).

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, S. T. Oliver, 2307 Fairfield Ave. SECY, E. D. Frazier, 320 Ashland Dr.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, L. F. Lawrence, Jr., 212 Greystone Rd. SECY, G. C. Garrett, P.O. Box 3697.

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon., PRES, R. A. Wilson, 2240 N. High St. SECY, T. R. Walker, 182 N. Yale Ave.

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, A. H. Gerdsen, 224 E. Second St. (2). SECY, T. D. Reiley, 1905 Dunlap St. (14.)

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, D. E. Tullis, 1720 Parkhill Drive (6). SECY, L. P. Brehm, Jr., 111 S. Broomfield Rd.

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, L. C. Burkes, 1792 E. 40th St. SECY, R. A. Urban, Sr., 1740 E. 12th St. (14).

Toledo: 1954. Hdqrs., Toledo. PRES, C. F. Hoffman, 523 Spitzer Bldg. (4). SECY, R. I. Fruth, 1316 Adams St. (2).

OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, J. R. Patten, 1726 N.W. Fifth (6). SECY, A. C. Shelley, 2946 Nimitz (12).

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, J. T. McKinney, P.O. Box 5145 (16). SECY, G. A. McCune, 1908 Utica Square.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, Dick Blankenship, Cascade Bldg. (4). SECY, W. B. Hayes, 707 Portland Trust Bldg. (4).

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, A. M. Robertson, 1200 Locust St. (7). SECY, R. J. Sigel, 822 Montgomery Ave., Narberth.

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, C. L. Benn, 420 Blvd. of Allies (19). SECY, E. H. Riesmeyer, Jr., 231-33 Fort Pitt Blvd. (22).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, R. K. Rouse, P.O. Box 3731, Greenville. SECY, B. A. Leppard, P.O. Box 3294, Station "A," Greenville.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, John Hilton, II, 4443 Sequoia. SECY, L. V. Eberle, Jr., 1358 Clementina.

TEXAS

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, J. A. Ray, 4411 Belmont Ave. (4). SECY, G. H. Meffert, 3328 Greenbrier Dr. (5).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, F. M. Neil, P.O. Box 13197 (19). SECY, A. B. Ullrich, 2520 Huldy St. (19).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, F. B. Frazee, 1013 Riverside Dr., Austin (4). SECY, J. L. Rea, Jr., 300 West 8th St., Austin.

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, R. S. Carow, P.O. Box 3206. SECY, H. L. Mayes, P.O. Box 151.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, R. C. Evans, 2549 Wilmington Ave. (6). SECY, G. E. Wright, Jr., Dooly Bldg.

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, T. B. Carpenter, 8400 Millard St. SECY, C. G. Conaway, Jr., 4701 Colley Ave. (5).

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, F. W. Jenkinson, 228 Hutton Bldg. SECY, J. A. Doyle, W. 3018 Broad.

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, P. I. L. Winsor, 20031 Marine View Dr., S.W. (66). SECY, M. W. McKinstry, 4017 McGilvra St. (2).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, I. J. Rossiter, 231 W. Wisconsin Ave. (3). SECY, R. D. Rodwell, 152 W. Wisconsin Ave. (3).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, Cornelius Van Boeyen, 636 Drake St. (3). SECY, A. C. Martin, 425 W. Second Ave.

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, G. C. Davis, 212 Waverly St. (9). SECY, A. H. Millar, 342 Mandeville St., St. James (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, R. J. Ker, 5000 Namur St. (9). SECY, W. E. Jarvis, P.O. Box 61.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, M. C. Bailey, 1139 Bay St. SECY, H. R. Roth, 57 Bloor St., W.

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, E. J. Schoenherr, 32 Clarey Ave. (1). SECY, D. W. Banton, 360 Richmond Rd. (3).

SPECIAL BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, H. C. Bechtler, Anemonenstrasse 40 (47). SECY, Walter Hausler, Erbstrasse 2, Kusnacht.

STUDENT BRANCHES

North Carolina State College: 1948. Hdqrs., Raleigh. PRES, R. E. Crawford, 106½ Logan Ct. SECY, S. R. Moore, Box 4317, State College.

Oregon State College: 1949. Hdqrs., Corvallis. Meets, 1st Wed. after 1st Tues. PRES, P. I. Anderson, 202 N. 10th. SECY, D. W. Strahan, 233 Mall St.

Purdue University: 1948. Hdqrs., W. Lafayette, Ind. PRES, D. B. Doucette, Purdue Student Branch, ASHAE, School of Mech. Engrg. SECY, J. W. Deabler, Purdue Student Branch, ASHAE, School of Mech. Engrg.

Texas A. & M. College: 1946. Hdqrs., College Station. Meets, 2nd and 4th Tues. PRES, D. F. Carroll, Box 6264. SECY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.

University of Detroit: 1949. Hdqrs., Detroit. Meets, 1st Tues. PRES, L. J. Hayes, Jr., 16254 Santa Rosa Dr. (21). SECY, E. F. Hoelscher, Jr., 14283 Cherrylawn (38).

University of Toronto: 1951. Hdqrs., Toronto. PRES, W. A. Stewart, 86 Roxborough St., W. (5). SECY, R. M. Davies, 144 Manor Rd., E.

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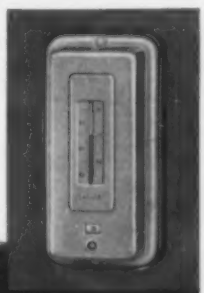

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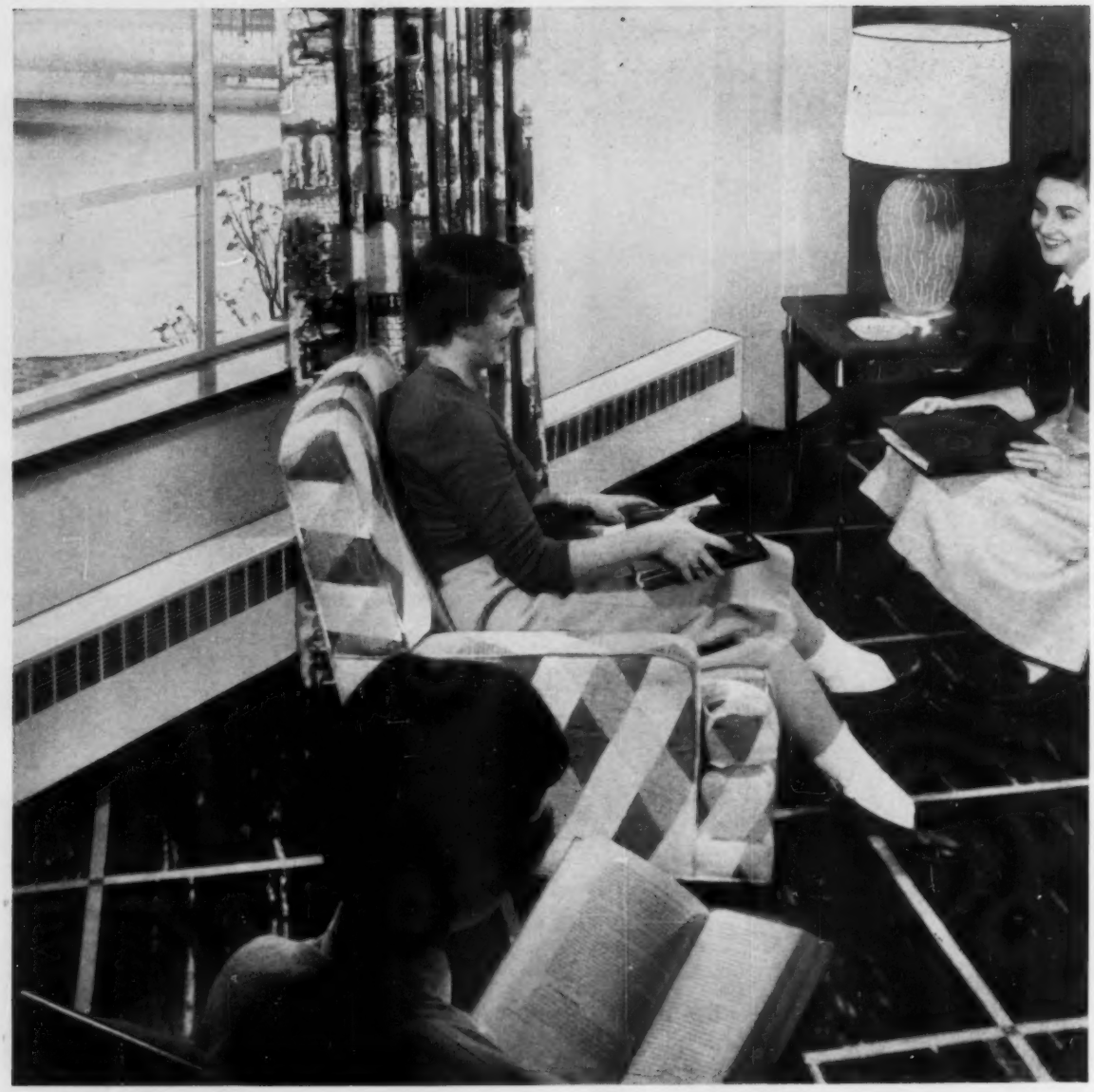


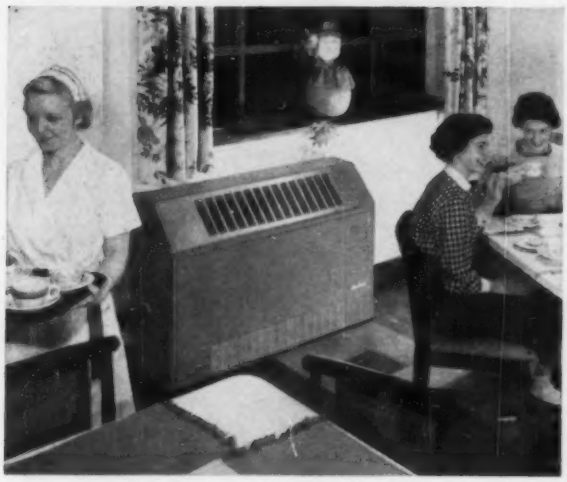
Dunham Finned Tube Radiation in main reception room used with METRO simplified method of piping at Assumption Hall, Duquesne University. Along-the-wall radiation is also available in four other styles—fits in anywhere.

Heating Contractor: George H. Soffel Co., Inc., Pittsburgh, Pa.

Architect: William York Cocken, Pittsburgh, Pa.

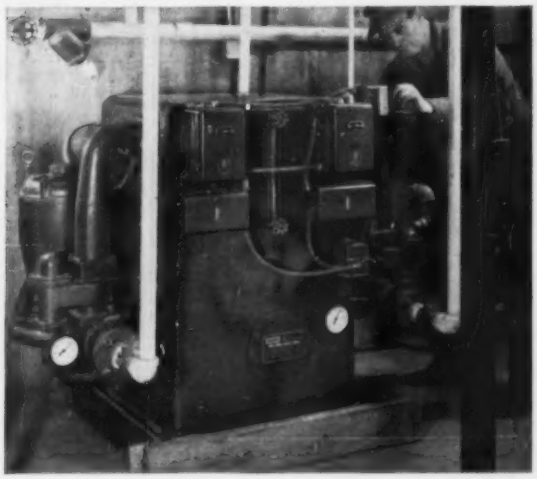
General Contractor: Duquesne University Department of Engineering, Pittsburgh, Pa.

Duquesne University knows that it pays to depend on DUNHAM



Dunham Type M Unit Heater in cafeteria at Assumption Hall, Duquesne University. Twin blower fans directly mounted on motor shaft distribute heat evenly and quietly over large area.

Dunham Convector in dormitory rooms . . . painted to blend with wall. Individual room heat control assured by knob-operated damper. Chain-operated damper available.



Dunham Vacuum Heating Pump—"heart" of the fuel-saving VARI-VAC® system. Keeps subatmospheric steam circulating under vacuum, produces pressure differential between supply and return METRO® piping. Quickly pulls air and condensate from system.

Dunham VARI-VAC Control Panel in Assumption Hall. Provides centralized, one-man operating station for all system settings and remote control readings. The electronic "brain" of this system saves up to 40% on fuel.

Duquesne University officials know from experience you can depend on Dunham for *all* heating equipment needs . . . from a simple radiator trap to fully engineered precision control systems that assure greater comfort for fewer fuel dollars.

That's why Dunham heating equipment is used throughout to heat Assumption Hall, Duquesne's beautiful new girls' dormitory. All radiation, unit heaters, vacuum pumps, temperature controls and heating specialties bear the brand—Dunham.

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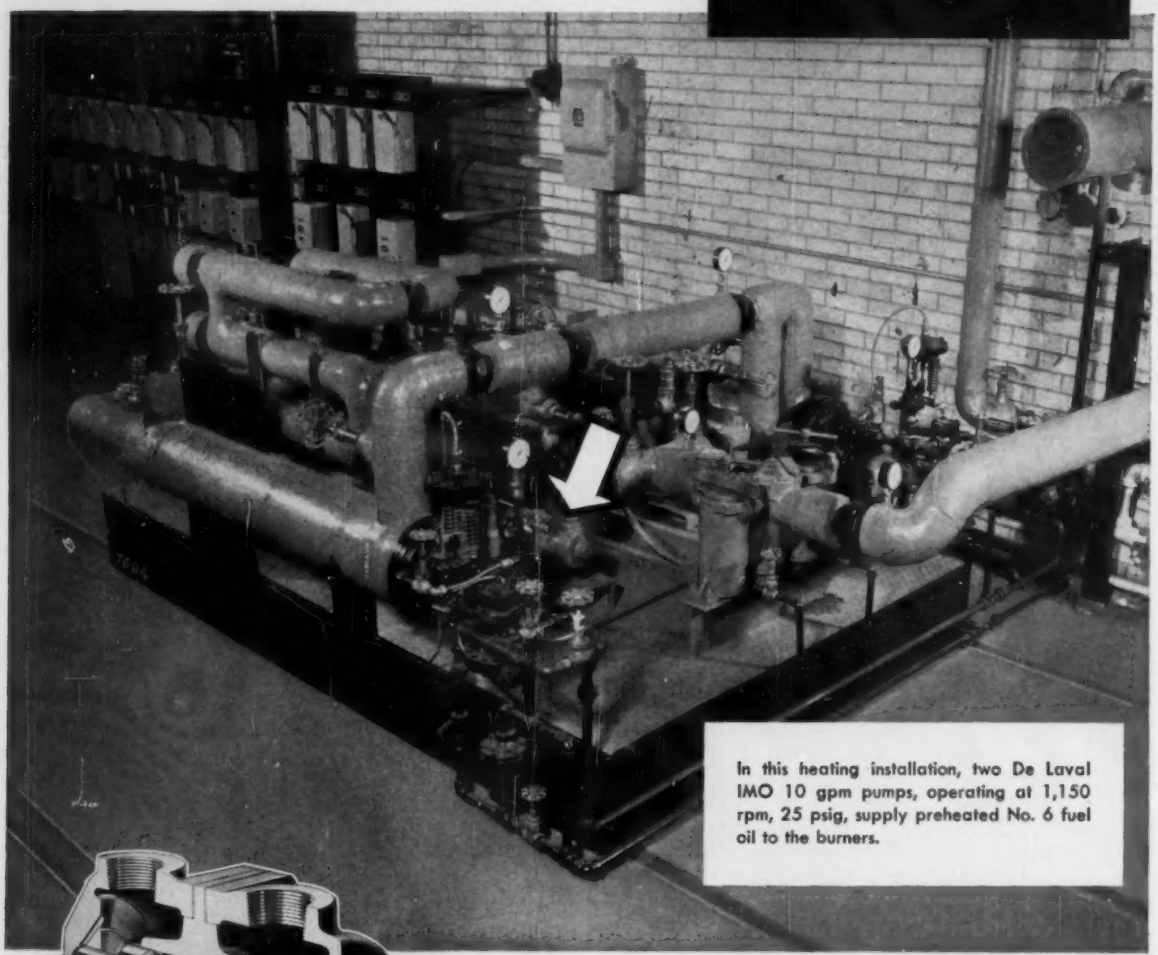
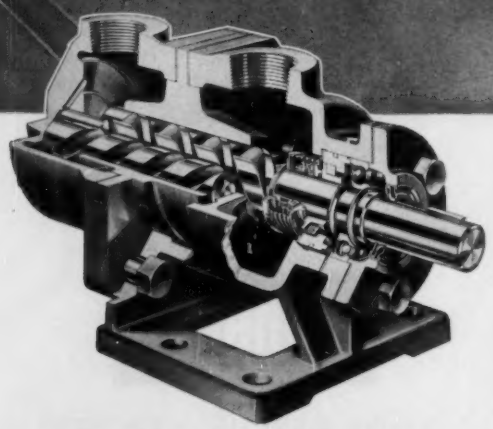


In this heating installation, two De Laval IMO 10 gpm pumps, operating at 1,150 rpm, 25 psig, supply preheated No. 6 fuel oil to the burners.



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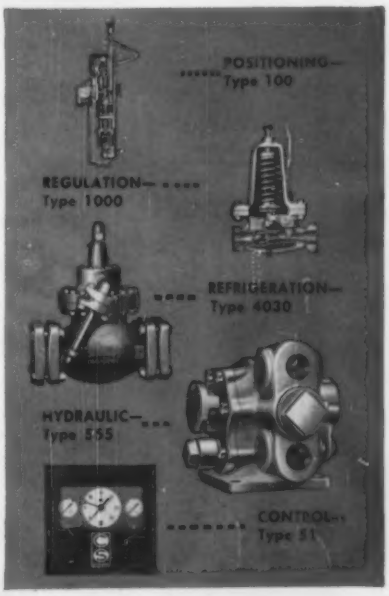

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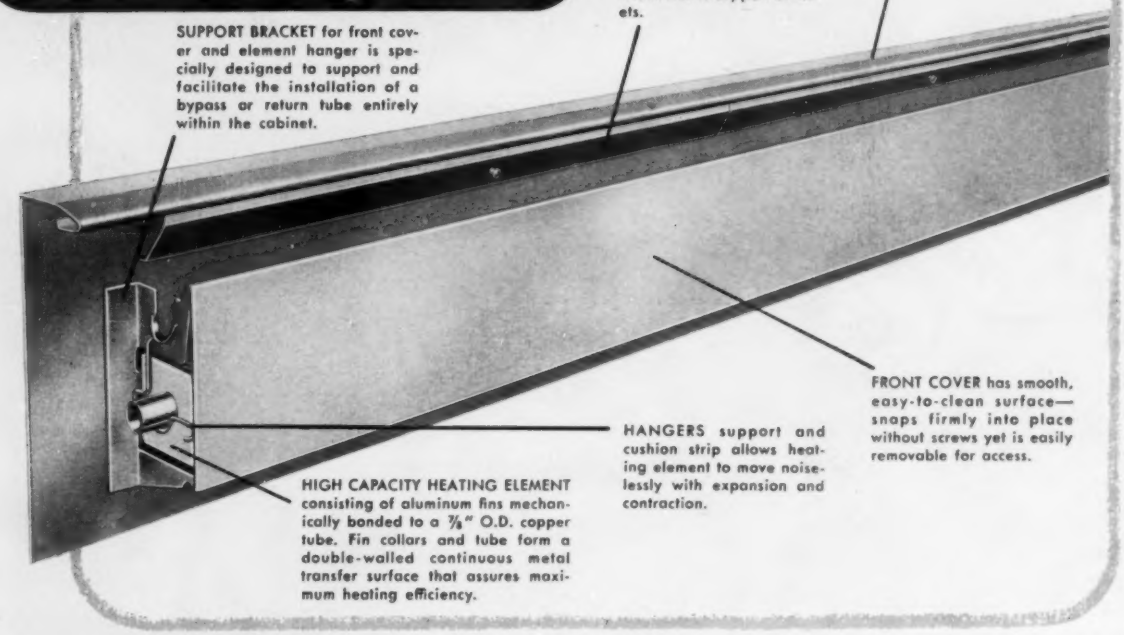
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SUPPORT BRACKET for front cover and element hanger is specially designed to support and facilitate the installation of a bypass or return tube entirely within the cabinet.
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HANGERS support and cushion strip allows heating element to move noiselessly with expansion and contraction.
HIGH CAPACITY HEATING ELEMENT consisting of aluminum fins mechanically bonded to a ⅞" O.D. copper tube. Fin collars and tube form a double-walled continuous metal transfer surface that assures maximum heating efficiency.

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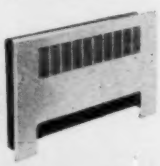
YOUNG FREE-STANDING CONVECTOR for new or remodeling jobs. Can also be installed semi-recessed.



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YOUNG LOW-LEVEL CONVECTOR just 12" high for placing beneath picture windows. Free-standing or semi-recessed.

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There is absolutely nothing like the Marley Double-Flow Aquatower in the intermediate capacity cooling tower field.

The name itself indicates the design and performance characteristics that make the Double-Flow Aquatower another Marley exclusive. "Double-Flow" denotes the use of patented Marley Double-Flow features developed for Marley industrial cross-flow towers. "Aquatower" suggests the trim appearance, low silhouette and compact design that is characteristic of Marley's famous packaged towers.

Years ahead in design when introduced several years ago, the Double-Flow Aquatower gained immediate professional acceptance. Engineers were pleased with its high performance . . . architects praised its low-silhouette . . . contractors appreciated the ease with which these towers can be constructed.

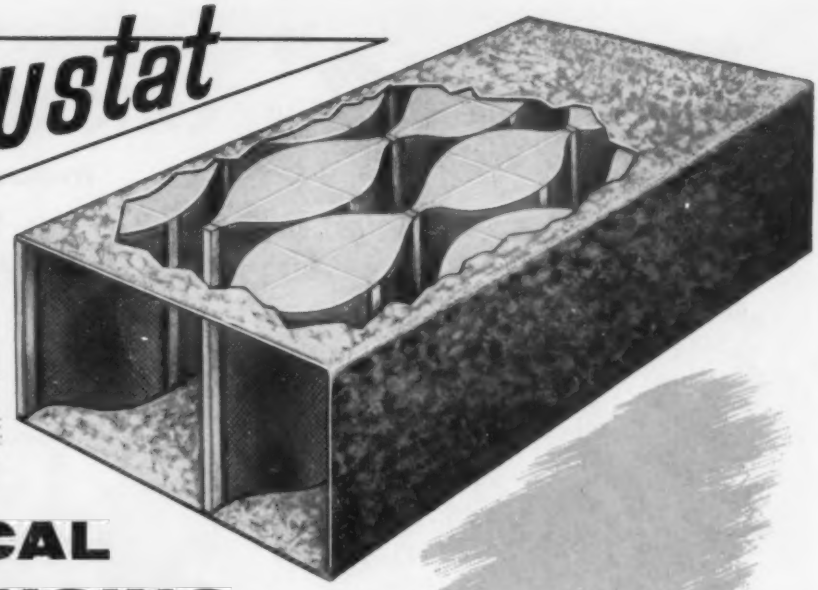
Today Double-Flow Aquatowers completely cover the water cooling front for intermediate capacity services. They are available in wood or steel structure with asbestos cement board casing and in single or multi-cell arrangements. Marley Application Engineers in any of 55 cities will gladly help you determine the sizes and models that meet your exact requirements.

The Marley Company

Kansas City, Missouri

MARLEY®

Aircoustat



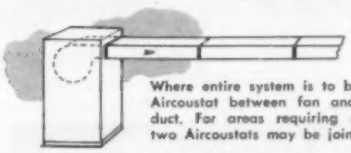
PRACTICAL SILENCING
for AIR CONDITIONING SYSTEMS

Aircoustat is a compact, *completely packaged* unit for silencing fan and air noise in air conditioning systems. Easily installed directly into the duct work, Aircoustat eliminates the need for costly, extensive duct lining. And results are astonishing: one *7 foot* unit reduces noise level below what *100 feet* of commercial duct lining could accomplish.

Engineered to provide broad band attenuation with low pressure drop, Aircoustat is available in 14 standard sizes for use with all styles and sizes of duct, and 8 types to meet any desired conditions. Selection is no problem: ***if it fits geometrically, it fits acoustically.***

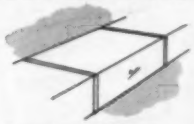
Where to install Aircoustat

Aircoustats are incorporated as part of the duct work. If only selected areas require quiet, install above individual diffusers.

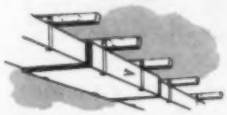


Where entire system is to be silenced, insert Aircoustat between fan and first length of duct. For areas requiring special silencing, two Aircoustats may be joined in series.

How to install Aircoustat



Aircoustat requires no special tools for installing. It is constructed to be joined to ductwork with a lock seam.



If ductwork and Aircoustat differ in size, a canvas or asbestos coupling may be used. If ductwork is hung, support Aircoustat similarly.

Mail this coupon TODAY ▶▶▶

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

INDUSTRIAL SOUND CONTROL, INC.
45 Granby St., Hartford 12, Conn.
Please send me more information on AIRCOUSTAT.

NAME .....
TITLE .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

these "Extras" in CHICAGO PUMPS

mean

Longer, Better Performance
Lower Cost Operation
and Installation

FLUSH-KLEEN Sewage Ejector TYPE "S"

The Flush-Kleen Sewage Ejector can't clog because only liquid is handled by the impeller. Coarse matter is strained out, then backwashed from the strainer into discharge pipes. No strainer baskets to clean, no repairs due to clogging, no foul basins because solids never reach the wet basin. Besides being easier to maintain, Flush-Kleens last longer and require less power. Write for details in Bulletin 122C.

DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

Accurately machined and fitted revolving parts in carefully cast casing. Have proved reliable for house pump, circulating and booster service. See Bulletin 101.

TYPE AVC CONDENSATION PUMP AND RECEIVER

Low inlet — no elaborate foundation needed for installation—for systems to 10,000 EDR and 10-30 psi. See Bulletin 245.

A COMPLETE LINE FOR EVERY BUILDING SERVICE

NEW F-C AND C-C PUMPS EITHER FLEXIBLE-COUPLED OR CLOSE-COUPLED

Compact, smooth running, quiet, — ceramic faced seal is highly resistant to wear — for circulating and booster service. Heads from 10 to 190 feet, capacities from 5 to 400 gpm. Bulletins 107 and 108.

SURE-RETURN CONDENSATION PUMP AND RECEIVER

Low inlet — positive head on suction — no friction in manifold between pump and receiver—handles extremely hot condensate without steam binding — for systems to 75,000 EDR and low or medium pressures. See Bulletin 250.

Write to Department B

For additional information on any of the above pumps, specify by bulletin number.

fmc

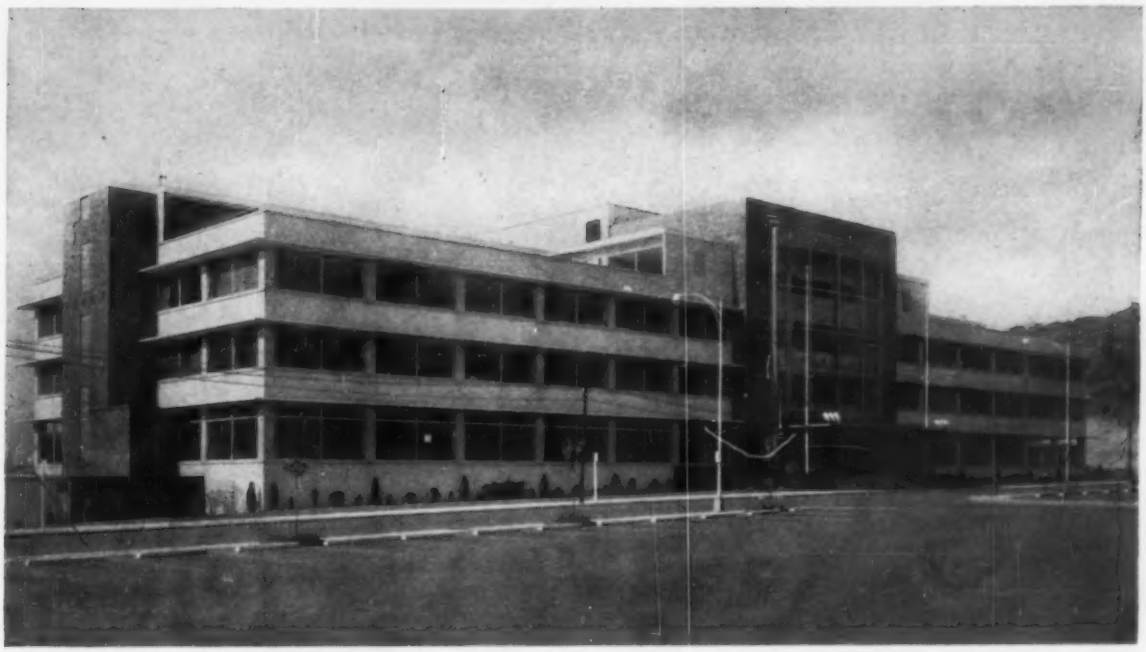
CHICAGO PUMP COMPANY

Subsidiary of Food Machinery and Chemical Corporation

BUILDING PUMP DIVISION

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems, Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every industrial use.



Thousands of feet of Beth-Co-Weld Pipe are used for general-purpose piping in the Tacoma City Light Administration Building, Tacoma, Wash. *Plumbing and Heating Contractor:* Northwest Mechanical Contractors, Inc., Tacoma; *Jobber:* American Plumbing and Steam Supply Company, Tacoma.

Office Building in Tacoma...
Hospital in Greenville, S. C....
Both Have Beth-Co-Weld Piping

Beth-Co-Weld Pipe is used in the plumbing and heating lines in the Greenville General Hospital, Greenville, S. C. *Plumbing and Heating Contractor:* Wrenn Bros., Rock Hill, S. C.; *Jobber:* Noland Co., Spartanburg Branch.

In virtually any type of new structure, large or small, you'll do well to select Beth-Co-Weld steel pipe for the heating and plumbing lines, and for sprinkler installations.

Beth-Co-Weld is ideal general-purpose pipe. It is made from sound steel by the continuous-weld process, and is uniform in quality and physical properties. It is easy to cut, thread and weld.

Beth-Co-Weld comes in sizes from ½ in. to 3 in., standard-weight and extra-strong, and in 21-ft lengths, plus or minus 1 in. It is also manufactured in 3½ and 4 in., standard-weight only, in lengths of approximately 22 ft.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

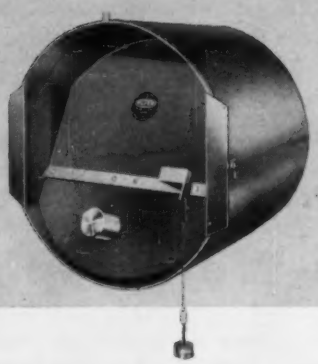
DEPENDABLE,

PRECISELY ACCURATE

Draft Control

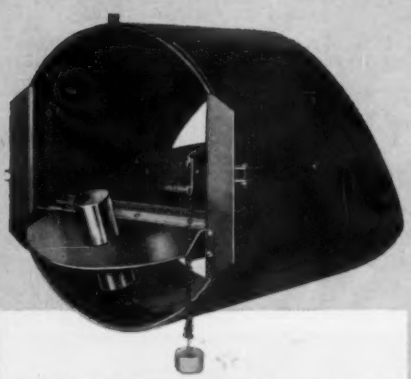
for coal fired, oil fired, gas fired or gas-oil fired

HEATING PLANTS



FIELD TYPE "M" for coal and oil fired heating plants

Heavy duty commercial model in 28" and 32" sizes. Heavy, rigid construction assures long, trouble free service. Stainless steel knife edge bearing for permanent sensitivity. Also available in 6" through 24" sizes for domestic and commercial installations. First choice of heating men — the round control you can level on any flue.



FIELD TYPE "MG" for gas and gas-oil fired heating plants

A heavy duty, precision built control in sizes 8" through 32" for commercial and industrial installations. Stainless steel knife edge bearings for permanent sensitivity. Gate opens inward to regulate updrafts, and outward to relieve down-drafts. Optional safety switch available where codes require. Fully proven, accepted virtually everywhere.

They're real HEAVYWEIGHTS

Compare the weight of a Field Control to any other available. Here is proof of the massive, welded construction, long, vibration-free service, that permits Field's supreme accuracy.

Size Control	Gate	Thickness of Parts Side Plates	Ring	Collar	Wt. without Crtn. or Crate
14 M	16 Ga.	16 Ga.	⅝ x 2"	22 Ga. Galv.	19#
16 M&MG	16 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	28#
18 M	16 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	35#
20 M&MG	16 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	41#
24 M&MG	14 Ga.	16 Ga.	⅝ x 2"	18 Ga. Galv.	65#
28 M&MG	14 Ga.	14 Ga.	¼ x 4"	14 Ga. H.R.S.	110#
32 M&MG	14 Ga.	14 Ga.	¼ x 4"	14 Ga. H.R.S.	140#

field

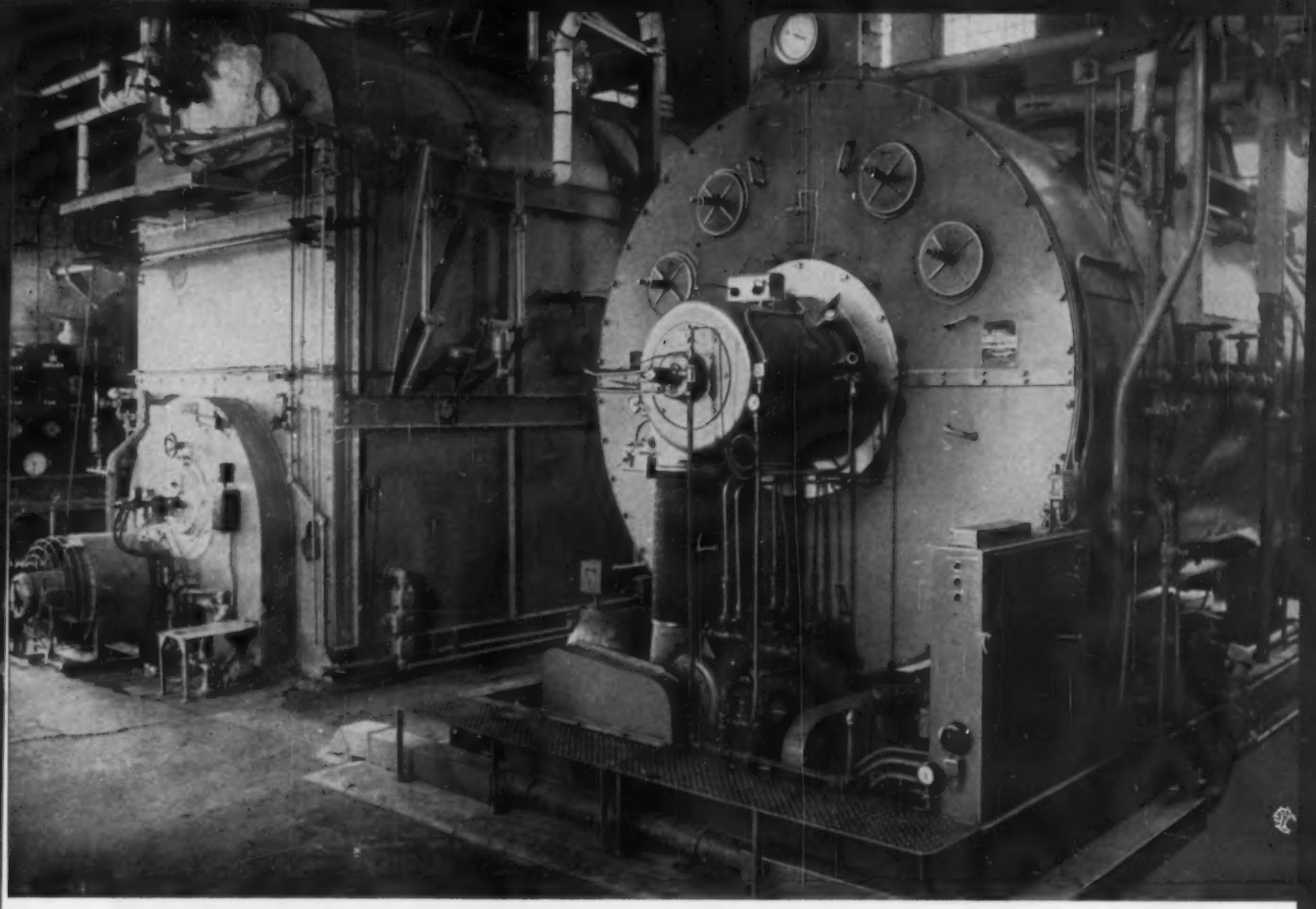
FIELD CONTROL DIVISION

of H. D. CONKEY & COMPANY, Mendota, Ill.

Affiliates

Conco Building Products, Inc. • Brick, Tile, Stone

Conco Materials Handling Division • Cranes, Hoists



Why was this *Powermaster*® switched from "Stand-by" to Full-Time Duty?

You get MORE than fuel economy with Powermaster

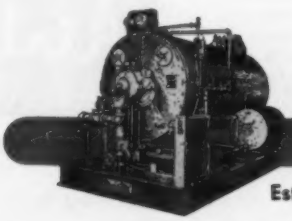
- ★ Low-cost, space-saving installation
- ★ Fast steaming
- ★ Instant response to load changes
- ★ Quick fuel change-overs
- ★ Clean, dry steam
- ★ Automatic operating and safety controls
- ★ Clean, quiet operation
- ★ Smokeless combustion
- ★ One-source responsibility for complete unit
- ★ Nation-wide factory-trained service organization
- ★ Pay-As-You-SAVE Purchase Plan

Originally purchased as a stand-by unit to supplement two older water-tube boilers, this 500 HP heavy oil *Powermaster* Packaged Automatic Boiler was quickly put on full-time duty by an Eastern rubber goods company.

The reason is *Powermaster's* fuel economy. While the *Powermaster* now carries the plant load continuously, the older boilers, one of which is shown at left above, are operated only when necessary.

Powermaster's cost-cutting and worry-saving advantages can be yours quickly and easily under Orr & Sembower's new Pay-As-You-SAVE Purchase Plan.

Write for Bulletin 1220.



Powermaster®

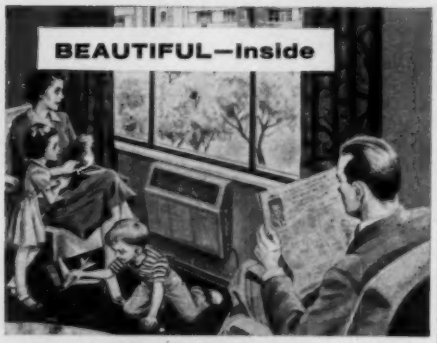
PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.

ORR & SEMBOWER, INC.

Established 1885 • Morgantown Road, Reading, Pa.

A NEW CONCEPT IN INDIVIDUAL ROOM AIR CONDITIONING!



All living rooms and bedrooms in the 230 apartments of New York City's smart new Randall House, designed by Boak & Raad architects, feature Airtemp "All-in-Wall" Air Conditioners built right in.

Airtemp installs new "All-in-Wall" units in 420 rooms in new Randall house

AIRTEMP BUILDS AIR CONDITIONING TO FIT ANY REQUIREMENT! Now, for those buildings where a central air conditioning installation does not meet all of your needs . . . Airtemp has developed "All-in-Wall" air conditioning . . . A new concept in individual room cooling. Look at these exclusive "all-in-wall" features:

Quiet! Airtemp engineered for super-quiet operation—no distracting motor noise—inside or out.

Individual Room Control! Each unit can be controlled by the tenant. Automatic thermostat is standard equipment.

Flush Outside! No outside projection to mar the beauty of the building.

Full Window View! Unit is out-of-the-way *under* the window . . . extends only inches into the room.

Full Capacity! Extra-high cooling capacity is engineered by Airtemp to meet the demands of the hottest weather.

Easy Installation! Eliminates expensive on-the-spot engineering costs in new or old buildings.

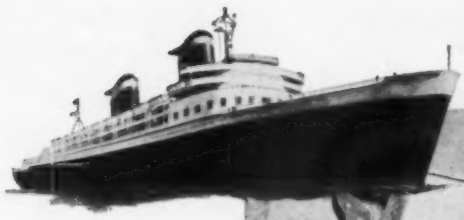
Easy Maintenance! Inside access plus identical cabinet size for ½, ¾ and 1 H.P. models.

Individual Metering! Each tenant absorbs the cost.

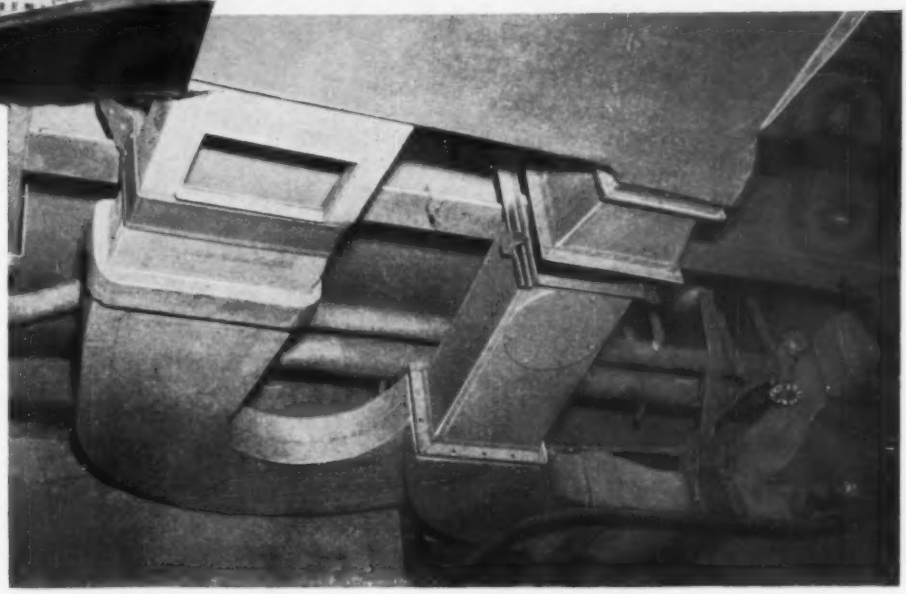
All these services are yours when you air condition with Airtemp . . . The top engineers of Airtemp Construction Corporation—local Airtemp servicemen—plus on the spot personnel equipped to guarantee efficient operation through all the years ahead. Write Airtemp Construction Corporation, Dayton 1, Ohio, for further details.

Airtemp
DIVISION
CHRYSLER CORP

AIR CONDITIONING FOR HOMES • BUSINESS • INDUSTRY



On the air conditioning ducts aboard the S.S. United States . . .



These Spintex insulated ducts are a vital part of the 65 air conditioning systems that honeycomb the new superliner S. S. United States.

NEW J-M *Spintex* INSULATION CONSERVES FUEL AND POWER

MILES OF DUCTS . . . a vital part of the 65 air conditioning systems that honeycomb the S. S. United States . . . are insulated with Johns-Manville Spintex. This insulation was selected because it makes possible maximum passenger comfort at minimum operating cost.

Low thermal conductivity . . . plus resistance to moisture, fire, rot and mold growth . . . make Spintex the most effective insulation for guarding against heat transfer and moisture accumulation.

Spintex in flexible and semi-rigid types, plus rigid Rock Cork* and Zerolite*, form a team of Johns-Manville insulations for air conditioning ducts that meet every industrial requirement. Basically mineral products, each insulation has its particular characteristics that make it specially suitable for a specific air conditioning service. All three have the low heat transfer properties needed for high insulating efficiency. Properly installed, these insulations for air conditioning ducts will perform their function effectively for the entire life of the equipment on which they are applied.

Since proper application is so essential to the peak performance of any insulation, Johns-Manville offers industry the services of experienced installation contractors who have made a career of solving complex insulation problems.

J-M Insulation Engineers and J-M Insulation Contractors are conveniently located. They stand ready to combine their talents and give you an insulation job that will pay off your initial investment with maximum fuel savings.

Why not let us send you a free copy of Brochure IN-135A which gives all the facts about Johns-Manville Insulations for Air Conditioning Ducts? Write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

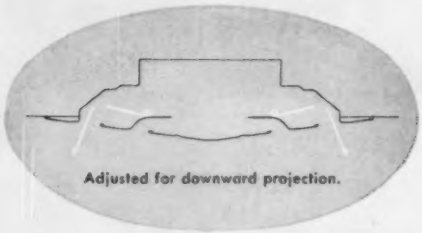
*Reg. U. S. Pat. Off.

Applying Johns-Manville Spintex insulation on one of the ducts aboard the S. S. United States during construction at the Newport News Shipbuilding and Dry Dock Company. Johns-Manville Insulation Contractors throughout the country know Spintex and other J-M insulations as *quality* products, and take pride in applying them properly for peak performance.

Johns-Manville *FIRST IN* INSULATION

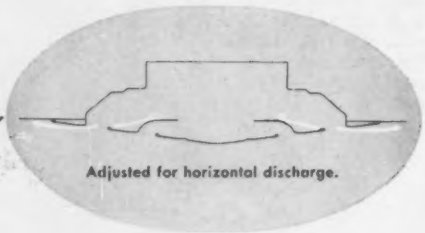
MATERIALS • ENGINEERING • APPLICATION

Take a look at a TRULY ADJUSTABLE Diffuser

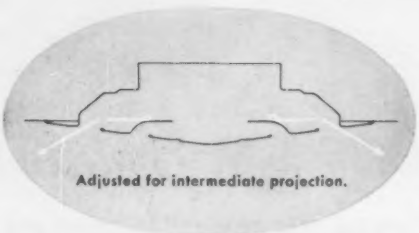


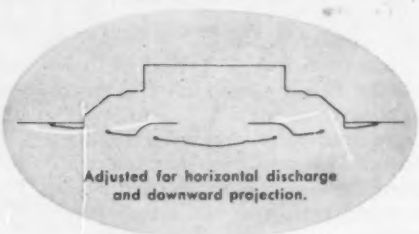
AGITAIR®

TYPE "OA"



Here's a distinctively different diffuser with a radically new means of controlling air direction at four different angles of discharge simultaneously. *Without changing the position of the spinnings,* AGITAIR "OA" diffusers can be adjusted to put the air where you want it in one, two, three or four directions . . . *after installation.* Result: Segmentized . . . positive adjustability with Finger-Tip Air Direction Control.





Write for Bulletin C-101

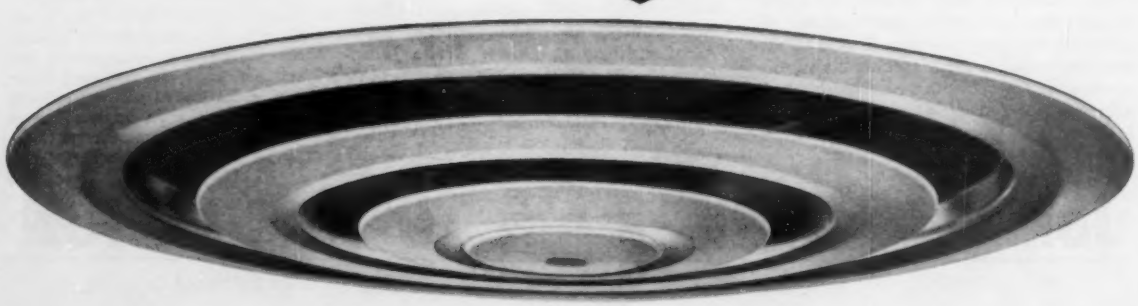
Contains complete data, performance charts, construction details, etc.

AIR DEVICES INC.

185 MADISON AVENUE NEW YORK 16, N. Y.

Air Diffusers • Filters • Exhausters

You Get Better Air with AGITAIR



FOR REMOTE CONTROL OF LIQUID LEVEL AND DIFFERENTIAL-USE

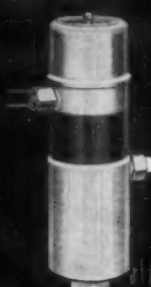
ALCO 908 electronic LECTRO-LEVEL

Just set the dials for accurate control of liquid level. For all refrigerants and all non-corrosive liquids with specific gravity of 0.5 or more. Request bulletin 908.

hold liquids LEVEL with ALCO CONTROLS

on flooded evaporators, shell and tube coolers, and large receivers

operate sump pumps, alarm bells, and other electrical devices



FOR FIXED LEVEL CONTROL USE

ALCO J-5 FLOAT SWITCH

Holds liquid level within 1/8" differential. Only two major parts. Easy to install and service. For all refrigerants and all non-corrosive liquids with specific gravity of 0.6 or more. Write for bulletin 175-1.

ENGINEERED FOR SERVICE FOR LIFE

SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

6769

MAMMOTH NEW ARLINGTON TOWERS TAKES PLENTY OF HEATING!

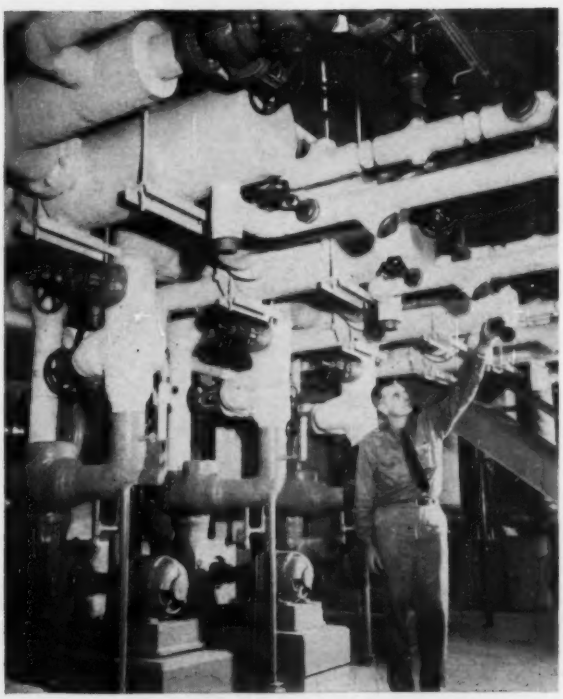
Arlington Towers, Arlington, Va., world's largest air-conditioned elevator type apartment project.

- *Cost:* $25,000,000
- *Architects:* G. V. Stone & D. H. Drayer, Washington, D. C.
- *Consulting Engineer for Heating:* General Engineering Associates
- *Mechanical Contractor:* W. H. Singleton Co., Inc., Arlington, Va.

. . . and 20 GENERAL Converters easily supply it for all 1684 apartments

Comfortable suburban living is the theme at beautiful new Arlington Towers Apartments. And an important part of the "comfort picture" is the heating of 869 efficiency apartments, 755 one-bedroom apartments, and 60 penthouses. GENERAL Converters do the job nicely. A compact bank of converters in each of the project's four spacious buildings provides high efficiency heat transfer from the steam lines to the circulating hot water system. There's always plenty of heat for each apartment.

This modern hot water heating system illustrates a typical application of GENERAL Converters in new apartment construction. Other successful installations of GENERAL Products are operating in all types of buildings from cottages to skyscrapers. Put GENERAL efficiency into *your* next job. Write for Catalogs 21 and 61. General Fittings Co., Box 151E, East Greenwich, R. I.



One of four centralized banks of steam-to-water GENERAL Converters that supply heat for Arlington Towers. Four of the five converters in each building supply 160°F water at 190 to 270 g.p.m. The fifth in each bank (not shown) supplies 200° water at 65 to 80 g.p.m.

GENERAL FITTINGS COMPANY

Manufacturers of Instantaneous Water Heaters, Converters, Fuel Oil Heaters, and Heating Specialties

For lowest cost steam generation, GE burns coal the modern way

General Electric's Major Appliance Division in Louisville, Ky., has five product manufacturing buildings, a warehouse and service buildings—over 4 million sq. ft. under roof. To generate all steam necessary for process work and heating requirements of this vast area, GE's power plant burns coal the modern way. Coal was chosen for two reasons. One, a careful fuel cost study disclosed that, on a straight economic basis, coal would give GE the lowest cost steam generation of all fuels. Second, availability of supply was considered and again coal won over other fuels. In addition, full mechanization of GE's power plant has facilitated all details of coal handling and ash removal while completely eliminating any possibility of air pollution.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D. C.

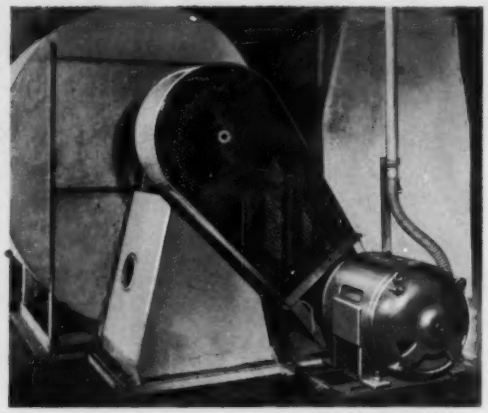
Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available. • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar. • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use. • No smoke or dust problems when coal is burned with modern equipment. • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

This modern air conditioning system uses ELLIOTT C-W ☆ motors



A 40-hp, 1745-rpm squirrel-cage motor driving a distribution fan at the U.N.

United Nations Headquarters—New York City comprises three attractively designed buildings. The Secretariat Building, shining in metal and blue-green glass, rises majestically 38 stories above the water. The rambling, low-set Conference and General Assembly Buildings complete the setting. Day in and day out, approximately 3,500 employees are going about their tasks under pleasant, comfortable working conditions. A modern, efficient air conditioning system makes this possible. Contributing to the effectiveness of this system are over 100 Elliott C-W motors. Ranging in size to 40 hp, they are driving fans to distribute clean, comfortable air throughout the installation.

For details on Elliott C-W motors in air conditioning systems, call your Elliott Representative, or write Elliott Company, Crocker-Wheeler Division, Jeannette, Pa.

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • BEARBRTHING HEATERS • EJECTORS • CONDENSERS
CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

The United Nations – located at 1st Ave. and 42nd St., New York City,
Builder and General Contractor: Fuller-Turner-Walsh-Slattery, Inc.
Consulting Engineers: Syska & Hennessy, Inc.
Architects: Harrison & Abramovitz.
Mechanical Contractors: General Assembly Bldg. – Kerby Saunders, Inc.
Secretariat Bldg. – Almirall & Co., Inc.

Photo Courtesy of United Nations

Now— CORROSION PROTECTION at a BUDGET PRICE

SCHAUB "03" *Deaerators*

- NEW, SIMPLER PRINCIPLE
- FIGHTS "RETURN LINE" CORROSION
- POSITIVE OXYGEN REMOVAL TO .03 CC/LITER

● Here is a deaerator of Schaub quality, engineered on new principles, designed especially to put effective boiler feed water deaeration within price reach of the small to medium size plant.

These plants, from 3,000 to 30,000 lbs/hr., often running at low pressure, are likely to have the same corrosion and high maintenance costs as their "big brothers". In fact, "Return Line Corrosion" is *most apt* to occur in *low pressure* heating systems even though raw water make up is negligible. For such plants, as well as for high pressure installations, the Schaub .03 Deaerator offers an effective and economical solution that will pay for itself many times over.

The Schaub .03 Deaerator operates *fully vented* at atmospheric pressure. Premium cost construction is eliminated, maintenance and operating costs are reduced to a minimum. Liberated, non-condensible gases escape *immediately* and *completely*. At the same time, simple but effective spray-contact vent condensing, prevents wasteful steam vapor loss. Pin-point temperature control, "live-action" heating and rust-proof chromasoid lining are exclusive features.

FRED H. SCHAUB ENGINEERING COMPANY

2116 South Marshall Boulevard • Chicago 23, Illinois

Get the Full Story on This More Efficient Low Cost Deaerator — Write for Bulletin 1300

Simple though it is, there's much more to the Schaub .03 Deaerator than can be told here. Bulletin 1300 is filled with information for the operating or consulting engineer responsible for economical and efficient deaeration of boiler feedwater. Tells the "hows" and "whys" of deaeration, especially for the small to medium size plant, explains how the Schaub method differs and its advantages in performance and low cost. Mail the coupon today.

NOTE: The Schaub .03 Deaerator is designed for boilers up to 30,000 lbs. per hour. For capacities up to 100,000 lbs. per hour at .005 cc/liter "zero-oxygen" removal write for Bulletin 575, describing the Schaub Zero-Oxygen Deaerator.

FRED H. SCHAUB ENGINEERING COMPANY
2116 South Marshall Blvd., Chicago 23, Illinois

Please send me, without cost or obligation, my personal copy of your new Bulletin 1300 on Boiler Feedwater Deaeration.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....ZONE....STATE.....

There's something personal we put into the life of every motor we build

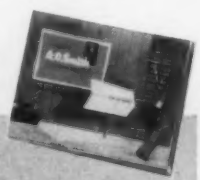
PICTURED above is one of A. O. Smith's skilled specialists who build integral hp and hermetic motors for heating, ventilating and air conditioning applications. Each of these men is proud of his work... proud that he is personally responsible for *complete* assembly of every motor he builds. This pride is an invisible part of every A. O. Smith electric motor . . . assuring tireless dependability to original manufacturers and ultimate users of powered equipment.

Today many manufacturers are installing A. O. Smith motors in evaporative condensers, blowers, refrigeration compressors, ventilators, unit heaters, etc. for commercial and industrial applications. They are sure of dependable performance because of the reasons described above . . . also because A. O. Smith motors are application-engineered to match particular product design. Remember! *Your special design is our standard.*

A. O. Smith builds motors in single and polyphase . . . in various speeds and frequencies . . . with low or high torque characteristics. These motors are backed by a national network of 270 strategically located factory service stations providing 24-hour service on all parts and service calls.

Ask for new bulletin!

Write for free, illustrated bulletin EM-154 that shows our complete facilities and unique approach to quality motor manufacture.



Through research ...*a better way*

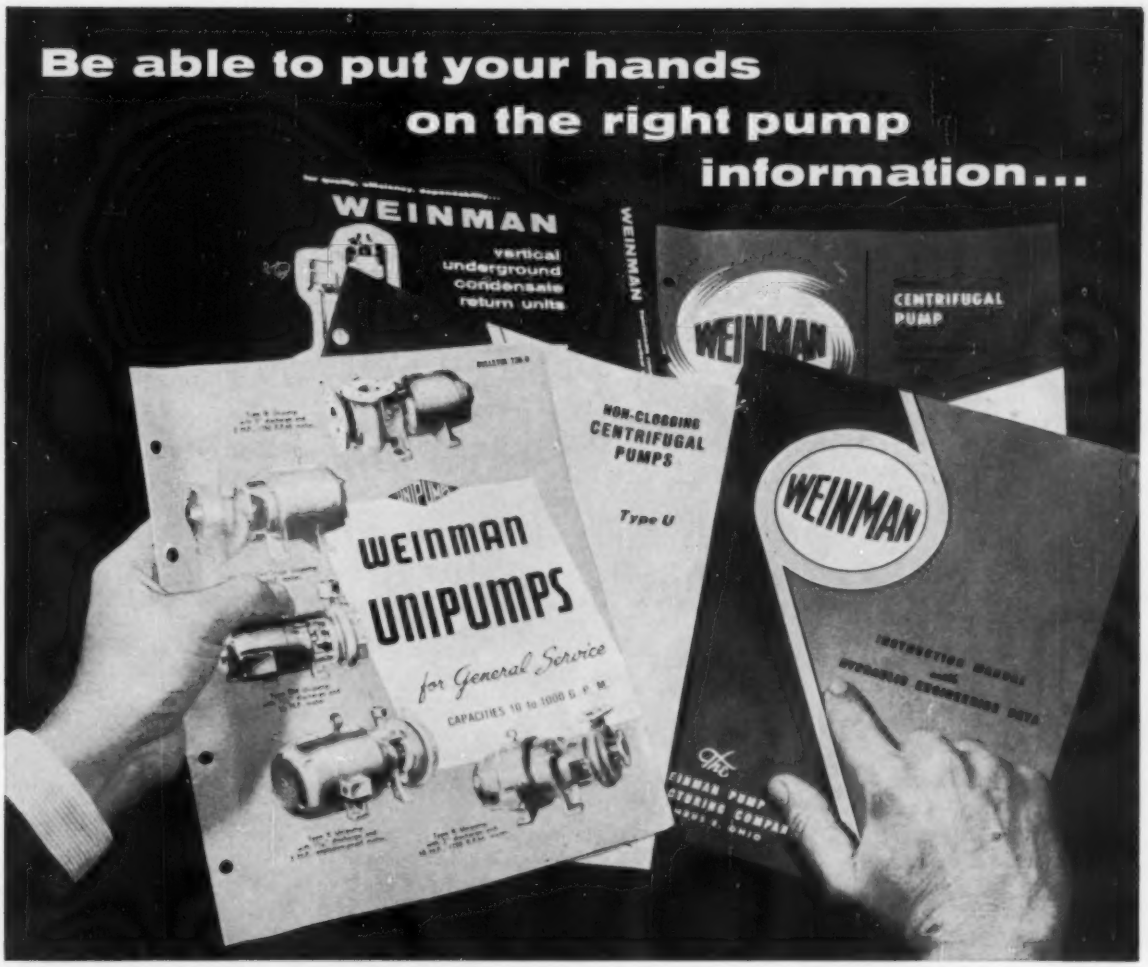
A.O.Smith

CORPORATION

ELECTRIC MOTOR DIVISION

TIPP CITY, OHIO

International Division, Milwaukee 1, Wisconsin, U. S. A.



for Heating and Air Conditioning Jobs

Perhaps you have a place for a dependable WEINMAN pump unit, *right now*—or are considering future applications. If so, you'll want these NEW WEINMAN bulletins to aid you in determining the BEST type of pump for the job you want to do.

From impeller to shaft seal, WEINMAN pumps are built better — for WEINMAN quality is *built-in!* That built-in quality adds up to dependable pumping efficiency for every job in your field — with WEINMAN.

Let a Weinman Centrifugal Pump Specialist help you solve YOUR pumping problems

No matter where you are, there's a qualified WEINMAN Centrifugal Pump Specialist who will gladly lend you a helping hand. See your telephone book yellow pages — or write for name of nearest representative.

SEND FOR BULLETINS NOW!

THE WEINMAN PUMP MFG. CO.

Send me these bulletins

- ☐ Instruction Manual with Hydraulic Engineering Data
- ☐ W-11 Condensate Return Unit to 40,000 EDR
- ☐ 726-D Close Coupled Unipumps for General Service
- ☐ 725 Type AC pump for Air Conditioning Systems

NAME

ADDRESS

CITY STATE

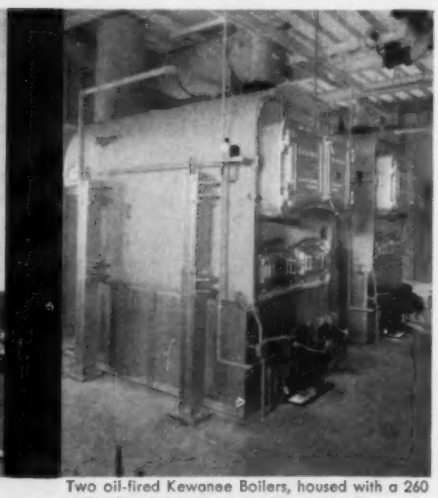
How Kewanee creates "safe weather" for fish...

KEWANEE reserve plus rated boilers

maintain constant temperature

Water temperature is like weather to fish and sudden variations of only a few degrees can be fatal. The problem at Marineland, world's largest oceanarium, Los Angeles County, California, is to meticulously maintain temperatures so its priceless deep sea specimens are not endangered. That's where Kewanee Boilers came in. Cold water from the sea is brought in at the rate of 2,000 gallons per minute. It is vital that boilers offer unfailing service so the inside water temperatures remain constant despite the ceaseless flow of water from the outside. Architects Pereira & Luckman specified Kewanee Reserve Plus Rated Boilers with 50% extra power built-in to take care of fluctuating demands. Only with reserve power could Marineland be sure its rare collection would be protected. And only boilers rated on nominal capacity with built-in reserve could meet the changing demands. So, if your problem is one of maintaining heat against as sharply a defined need as a few degrees change in temperature, or the broad problem of assuring sufficient power when expansion comes, choose Kewanee. You can be sure of unfaltering service.

Marineland Oceanarium, Los Angeles County, California, where rare fish are protected by Kewanee Boilers which assure uniform water temperature. Architects & Engineers: Pereira & Luckman/ Heating Contractor: Mehring & Hanson Company

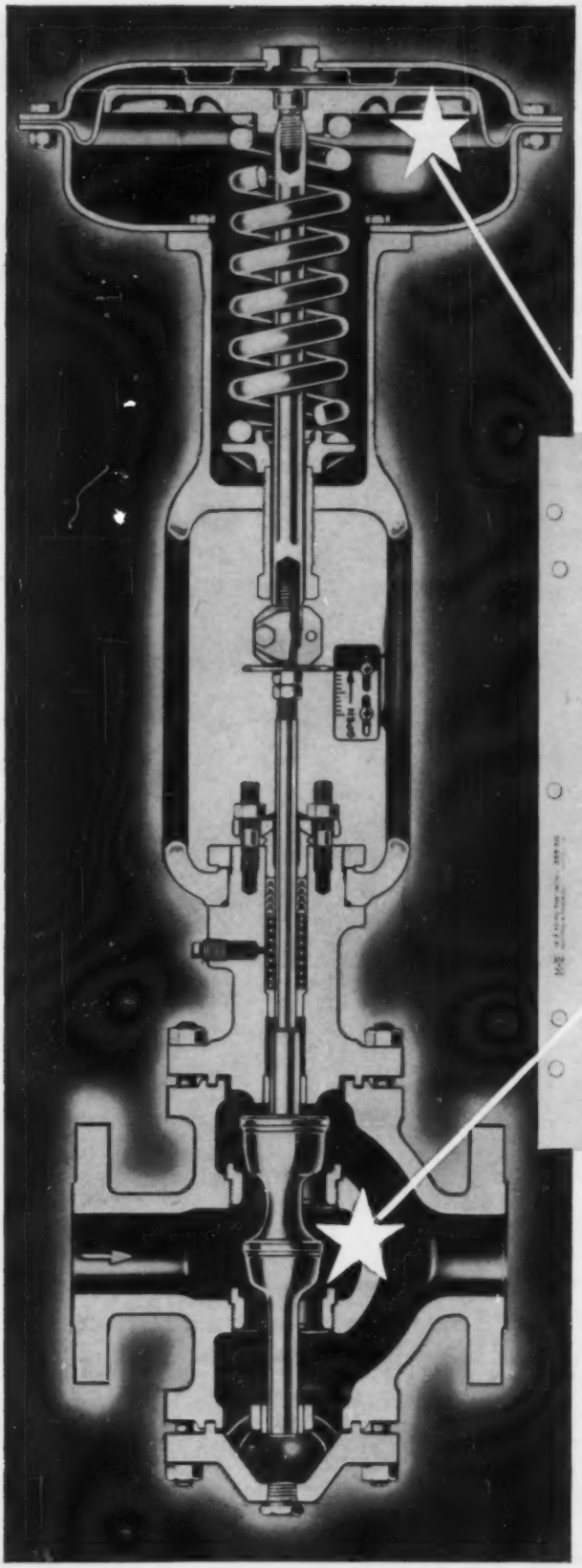


Two oil-fired Kewanee Boilers, housed with a 260 gallon hot water storage tank.

KEWANEE-ROSS CORPORATION, Kewanee, Illinois
Division of American Radiator & Standard Sanitary Corporation

KEWANEE ROSS

Serving home or industry American-Standard • American Blower • Church Seats & Wall Tile • Detroit Controls • Kewanee Boilers • Ross Exchangers • Sunbeam Air Conditioners



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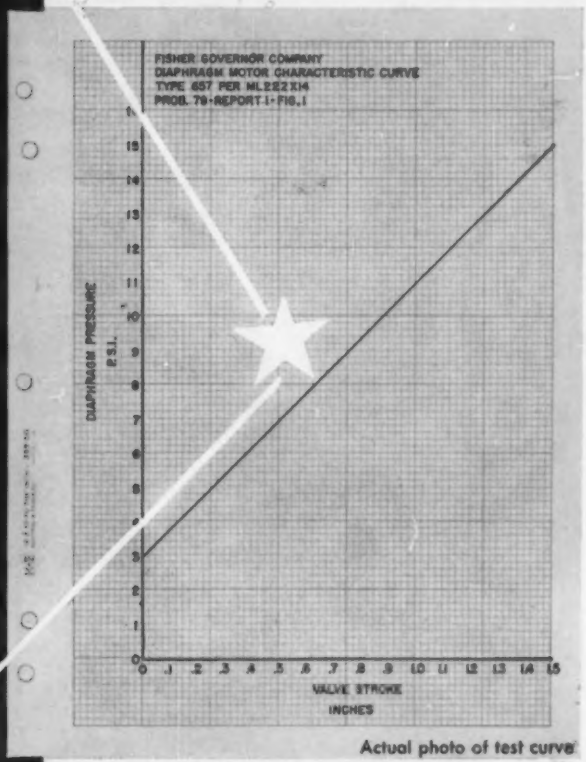
Improved Design

DIAPHRAGM MOTOR VALVES



Actual photo of test curve

NEW SUPER STRUCTURE PROVIDES LINEARITY OF OPERATION

Special molded diaphragm, in combination with deep casing, provides constant diaphragm effective area. Resultant linear relationship between input signal and inner valve position makes *flow versus diaphragm pressure* characteristic of control valve identical to *flow versus lift* characteristic.

FISHER GOVERNOR COMPANY
MARSHALLTOWN, IOWA
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Our 75th
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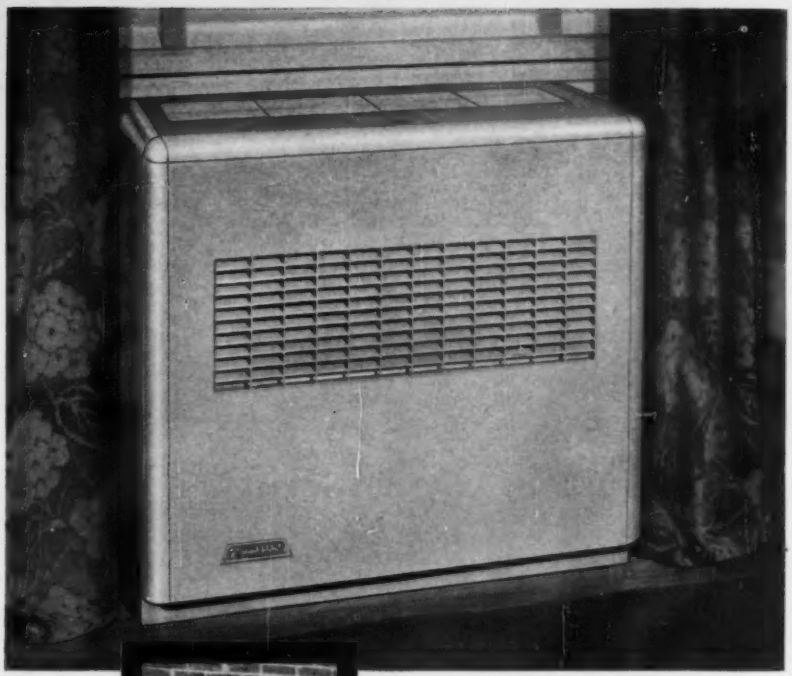
Only the best thing



Rust-proof and attractive exterior louvre opening is flush with the outside of the building.

Each room unit provides forced air circulation of both heating and cooling. Dehumidifies. Ventilates with fresh outside air or exhausts stale inside air. Installed on outside walls (most often under windows), the handsome unit extends only 15½ inches into the room. It's prime-coated . . . ready for painting to match room decor.

JUST LOOK AT THE FEATURES:

1 Hot water or steam coil provides heat in abundance, gently circulated by big-twin centrifugal blowers.

2 Individual room temperature control is easy with push-button selector. Heating-cooling thermostat provides uniform comfort.

3 Full-width cooling coil has extra capacity for even air distribution, ample dehumidification.

4 Propeller fan exhausts heat from condenser coil to outside of building . . . can be used to exhaust stale room air.

5 Entire 1 hp refrigeration cycle mounted on easy-to-remove frame. No need to disturb heating coils or piping to remove for service.

6 Chases completely conceal supply and return pipes, valves, etc.; make attractive installation.

that ever happened

for year-'round room comfort in commercial and institutional buildings

new RECESSED AIR CONDITIONER

BY Mueller Climatrol

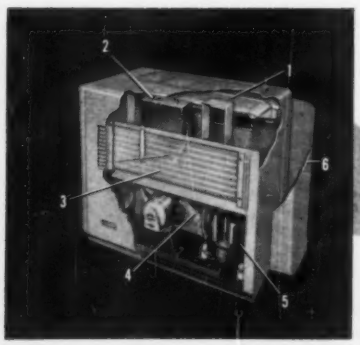
HEATS with steam or hot water.

COOLS with its own air-cooled refrigeration cycle.

CONTROLS heating and cooling in each individual room with built-in thermostats.

COSTS about half as much installed as a complete central cooling system alone.

IDEAL for both new and existing buildings, single or multi-story.



Get the facts about the new Recessed ***year-'round Air Conditioner*** *by Mueller Climatrol. Mail this coupon for literature.*

MUELLER CLIMATROL
2023 West Oklahoma Avenue, Milwaukee 15, Wisconsin

98th Anniversary

Please send me illustrated literature about the new Recessed year-'round room air conditioner.

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Firm Name _____

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SPANG® CW STEEL PIPE GIVES TOP-QUALITY SERVICE AT MERRY ACRES MOTEL

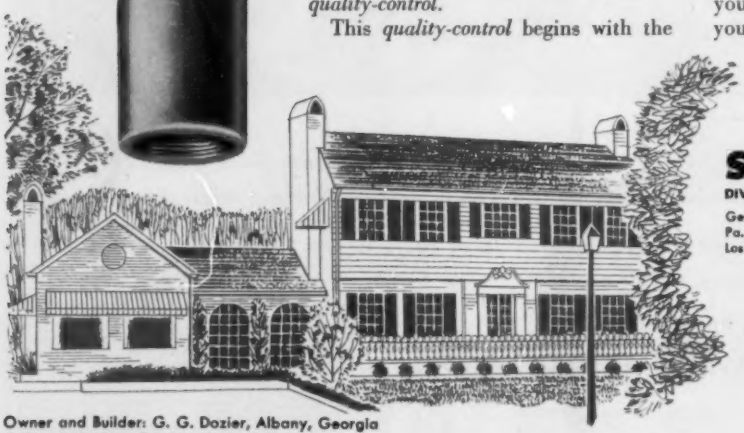
Merry Acres Motel, situated on ten acres of beautiful ground in a quiet suburban section of Albany, Georgia, is typical of the many new motels that line our highways, offering *top-quality* service to motorists. Each of the 33 rooms at Merry Acres was planned to give overnight guests maximum comfort and convenience.

To assure a *top-quality* plumbing installation in each room, 2,165 feet of SPANG CW Steel Pipe were installed. The specs called for SPANG CW, not only because it is easy to work with, but also because it has a *top-quality* reputation for giving years of dependable service. These two important factors are the result of SPANG's careful *quality-control.*

This *quality-control* begins with the selection of *top-grade* skelp, continues through the close control of the manufacturing process, and includes the final inspection and testing of the finished pipe.

Quality-controlled SPANG CW is easy to bend, cut, thread and weld. It has strong, uniform welds; smooth, clean inside finish; uniform diameter . . . all important features in lowering installation time and costs.

Why don't you take advantage of SPANG's *quality-control?* Whatever your piping needs may be—radiant heating, snow-melting, plumbing, air conditioning or water lines—SPANG CW Steel Pipe will give you *top-quality* service. See your local SPANG Distributor, for your next order of pipe. He will give you *top-quality* service, too.



SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY

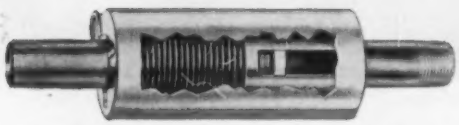
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

Owner and Builder: G. G. Dozier, Albany, Georgia
Architect: Rayburn Webb, Albany, Georgia
Plumbing Contractor: Lipsey Heating and Plumbing Company, Albany, Georgia
Spang Distributor: Engineering and Equipment Company, Albany, Georgia

NOW AVAILABLE...

the answers to expansion control problems in steam and hot water heating systems...

with FLEXON EXPANSION COMPENSATORS



Model H, High Pressure Type—for pressures to 150 psig, temperatures to 750° F. Handles total motion to 1¾" (1½" compression, ¼" extension). Available with all commonly used fittings. Pipe sizes: ¾" through 3".

Model L, Low Pressure Type—for pressures to 40 psig, temperatures to 250° F. Handles total motion to ⅝" (½" compression, ⅛" extension). Available with all commonly used fittings. Sizes ¾" through 2".

Another first for Flexonics Corporation—a complete package for heating system expansion control—a low pressure unit for horizontal steam and hot water lines . . . a high pressure type for steam and hot water risers and horizontal runs . . . and detailed application data—everything you need.

Bulletin 151 gives full specifications on both types of Flexon Expansion Compensators plus the information you need for putting them into a system. It shows you how Flexon Expansion Compensators economically solve such troublesome expansion problems as excessive maintenance, bulkiness, pipe buckling, complicated installation, etc.

Ask for your copy of this handy guide to heating system expansion control, today. There is no obligation.

FC-13

Flexonics *Corporation*

Flexon identifies products of Flexonics Corporation that have served industry for over 53 years.

EXPANSION JOINT DIVISION
1391 S. Third Avenue
Maywood, Illinois
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexonics Corporation HP
1391 S. Third Ave.
Maywood, Ill.

Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

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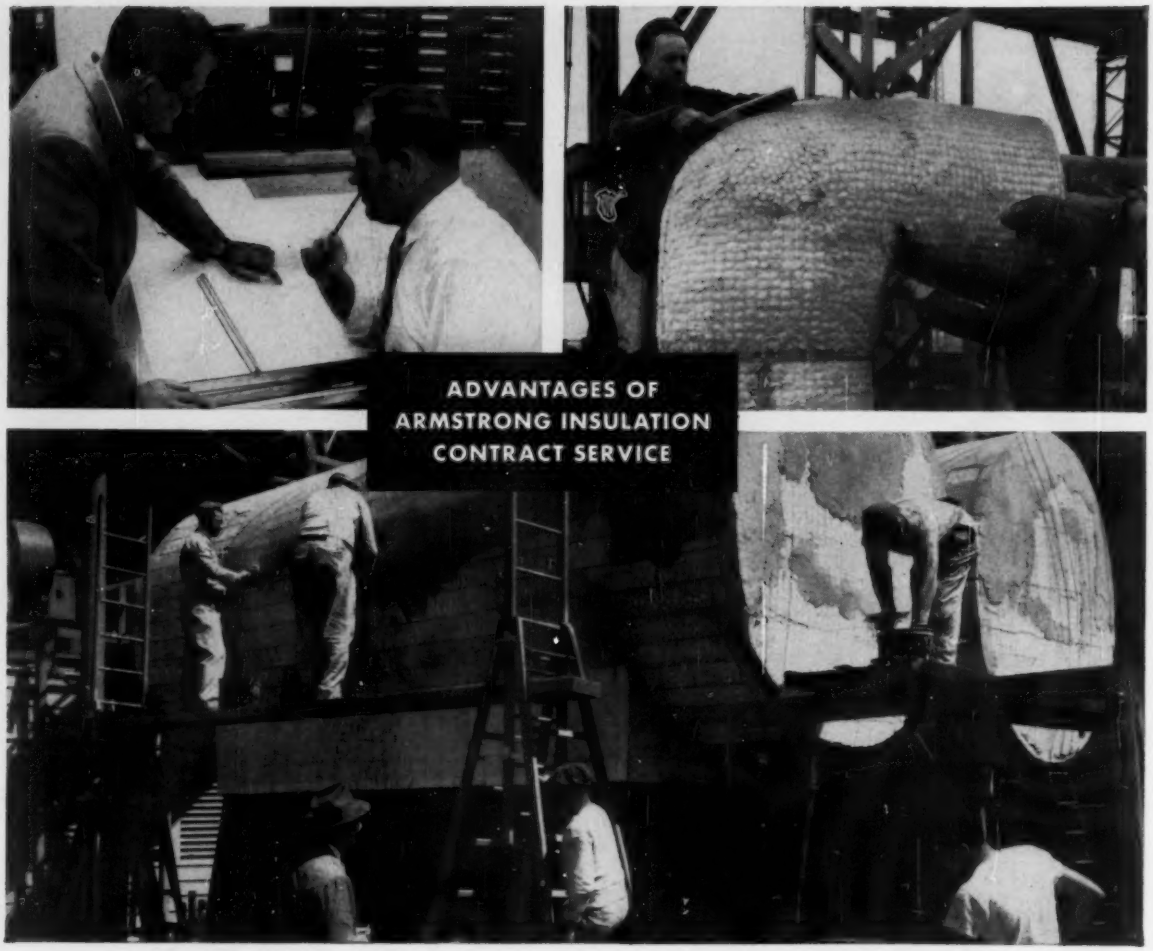
Company .....

Address .....

City ..... Zone .... State .....



ON-THE-JOB SUPERVISION . . . *trained people oversee your job from start to finish*

A good way to avoid delays on a construction project is to plan the job carefully—then provide the type of supervision that will make the plan work. Armstrong makes every effort to execute insulation contracts that way.

When you buy insulation work from Armstrong, the sales engineer is your contact with the Armstrong organization. He remains your contact until the job is completed to your satisfaction. Working with him is a construction superintendent who arranges material deliveries and labor schedules. Installation is by skilled mechanics under the supervision of a trained foreman.

No matter where your next insulation job may be, you can depend on Armstrong's ability to perform. A nation-wide network of 42 offices provides a full line of high- and low-temperature insulations, as well as the technical assistance of qualified engineers. The facilities of the Armstrong Research and Development Center are also available to help with special problems.

Get full details on the many advantages Armstrong's Insulation Contract Service offers you by calling your local Armstrong office or writing to Armstrong Cork Company, 2012 Sherman Street, Lancaster, Pennsylvania.

Armstrong INDUSTRIAL INSULATIONS

Armabestos* • Armaflex* • Armaglas* • Armatemp* • Corkboard • Cork Covering • Insulcolor®

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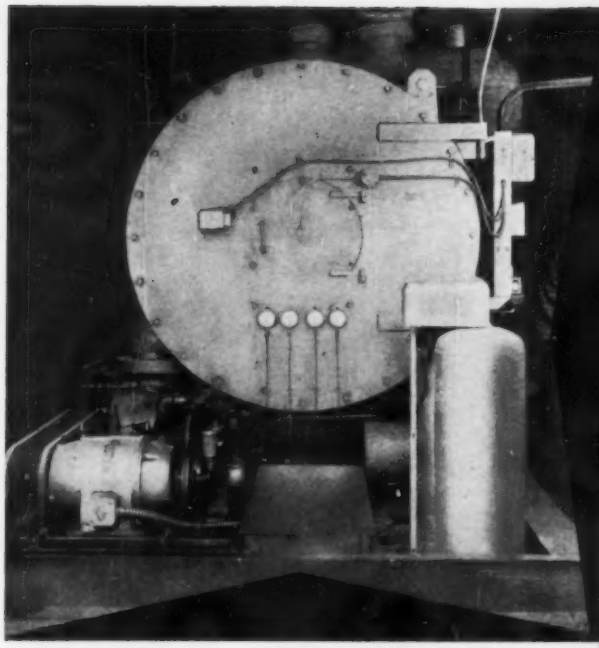


225 hp York-Power Steam Generator in Arvin Industries Inc. Plant.

THIS VERSATILE GENERATOR SOLVES PLANT HEATING AND PROCESSING PROBLEMS, TOO!

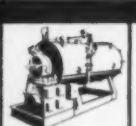
One York-Power Steam-Pak generator carries entire heating load of big Arvin Industries Inc. plant

The Arvin Industries Plant at North Vernon, Indiana was bothered with dust and grit from inefficient, coal-fired heating equipment. To overcome this, they installed a 225 hp, 15 psi, YORK-POWER Oil-fired Steam-Pak generator.

This one generator now takes care of their *entire* heating load, including 40 unit heaters located in four buildings . . . a total of 91,000 sq. ft. of floor space. In addition this York-Power generator heats 34,000 gallons of water, in 27 processing tanks, as high as 212°F. Steam from this generator is also used to distill water for mirror-silvering operations.

As a result, Arvin has eliminated their coal dust problems, enjoys far greater heating efficiency, and a worthwhile economy, too. Find out how YORK-POWER units can serve and save for you. Your nearest York-Shipley Representative will give you full details. Call him today.

4/S



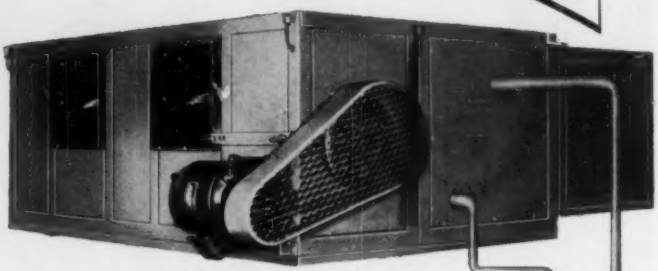
ONLY YORK-POWER HAS ALL 4

Industrial Division

YORK-SHIPLEY, INC.

YORK, PENNSYLVANIA

THE KENNARD Engineered LINE COMPLETES THE JOB



KENNARD AIR CONDITIONING BLOWER UNITS

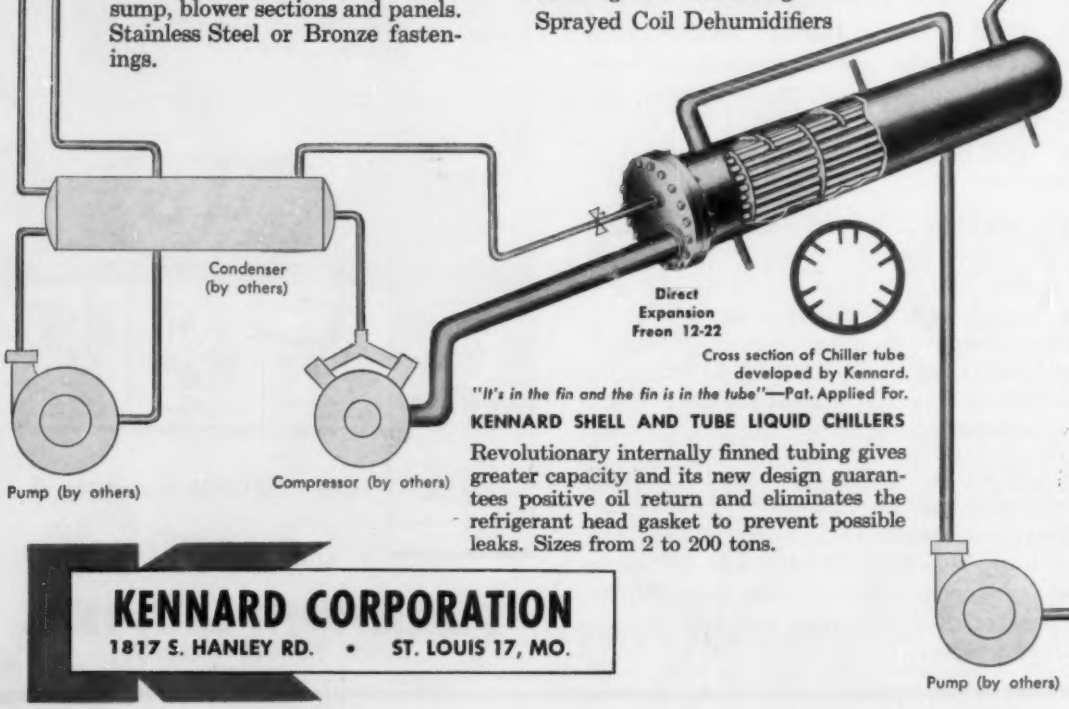
are adaptable to all forms of air conditioning installations. 14 sizes. 400 to 21,600 C.F.M. Vertical or Horizontal.

Complete the job with other KENNARD products

Coils—Cooling or Heating
Multi-Zone Air Conditioning Units
Evaporative Condensers
Heating and Ventilating Units
Sprayed Coil Dehumidifiers

KENNARD COOLING TOWERS

Made in 8 sizes—from 15 to 75 tons. Durably built, completely corrosion proof by galvanizing (after fabrication) wheels, scrolls, sump, blower sections and panels. Stainless Steel or Bronze fastenings.

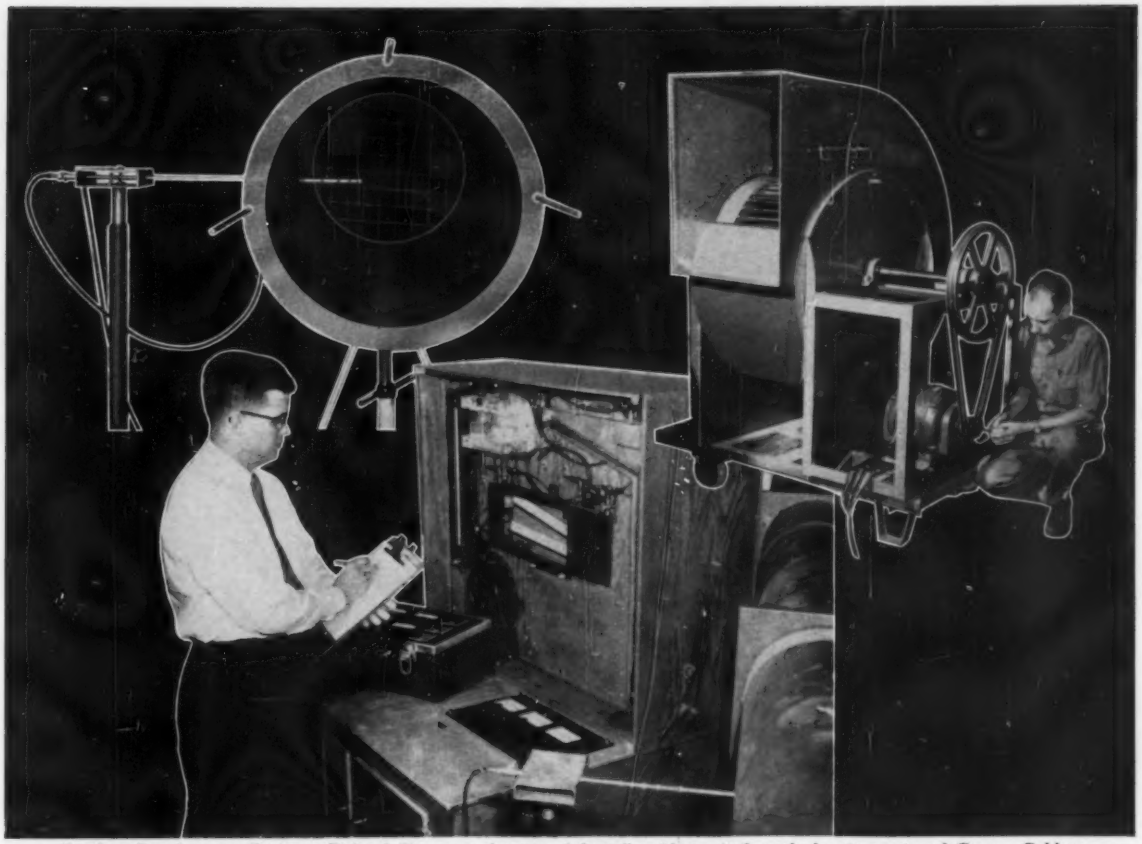


Cross section of Chiller tube developed by Kennard.
"It's in the fin and the fin is in the tube"—Pat. Applied For.

KENNARD SHELL AND TUBE LIQUID CHILLERS

Revolutionary internally finned tubing gives greater capacity and its new design guarantees positive oil return and eliminates the refrigerant head gasket to prevent possible leaks. Sizes from 2 to 200 tons.

KENNARD CORPORATION
1817 S. HANLEY RD. • ST. LOUIS 17, MO.



Peerless Development Engineer Richard Thompson (at control board) guides unit through development and George Goldner conducts final inspection.

VERIFIED BLOWER PERFORMANCE

● It just makes good sense to specify Peerless. Every fan or blower leaving our plant is unconditionally guaranteed to meet all established industry test codes (NAFM or PFMA). To an engineer, guaranteed performance means specifying without doubt—to a contractor it means good performance and no callbacks.

OUTSTANDING PERFORMANCE. The outstanding service records of Peerless fans and blowers stem from excellent design and thorough tests in every step of development and manufacture. A minimum of eight, 20-point determinations are made during the development period alone.

100% INSPECTION. Every unit (including the job-matched Peerless custom-built motor) receives 100% inspection before it leaves our plant. Wheel alignment and lubrication are checked . . . variable pitch pulleys are adjusted to correct motor RPM for exact CFM . . . angle of discharge is set . . . each unit is ready to go when you receive it.

COMPLETE LINE. There is a Peerless fan or blower for virtually every application. Complete data is catalogued for easy reference. Peerless Bulletin SDA-160 shows fans and forward curve blowers. Bulletin SDA-200 gives complete data on backward curve blowers (NAFM) from 12½" to 36½". These two bulletins will help you solve most air-moving problems. To get your copy, use the coupon below. Dimension prints are available on request.

FAN AND BLOWER DIVISION

Peerless Electric **THE PEERLESS ELECTRIC COMPANY**

1409 W. MARKET ST. • WARREN, OHIO

FANS · BLOWERS · MOTORS · ELECTRONIC EQUIPMENT

THE PEERLESS ELECTRIC CO.
WARREN, OHIO

☐ Send me Bulletin SDA-160.
☐ Send me Bulletin SDA-200.

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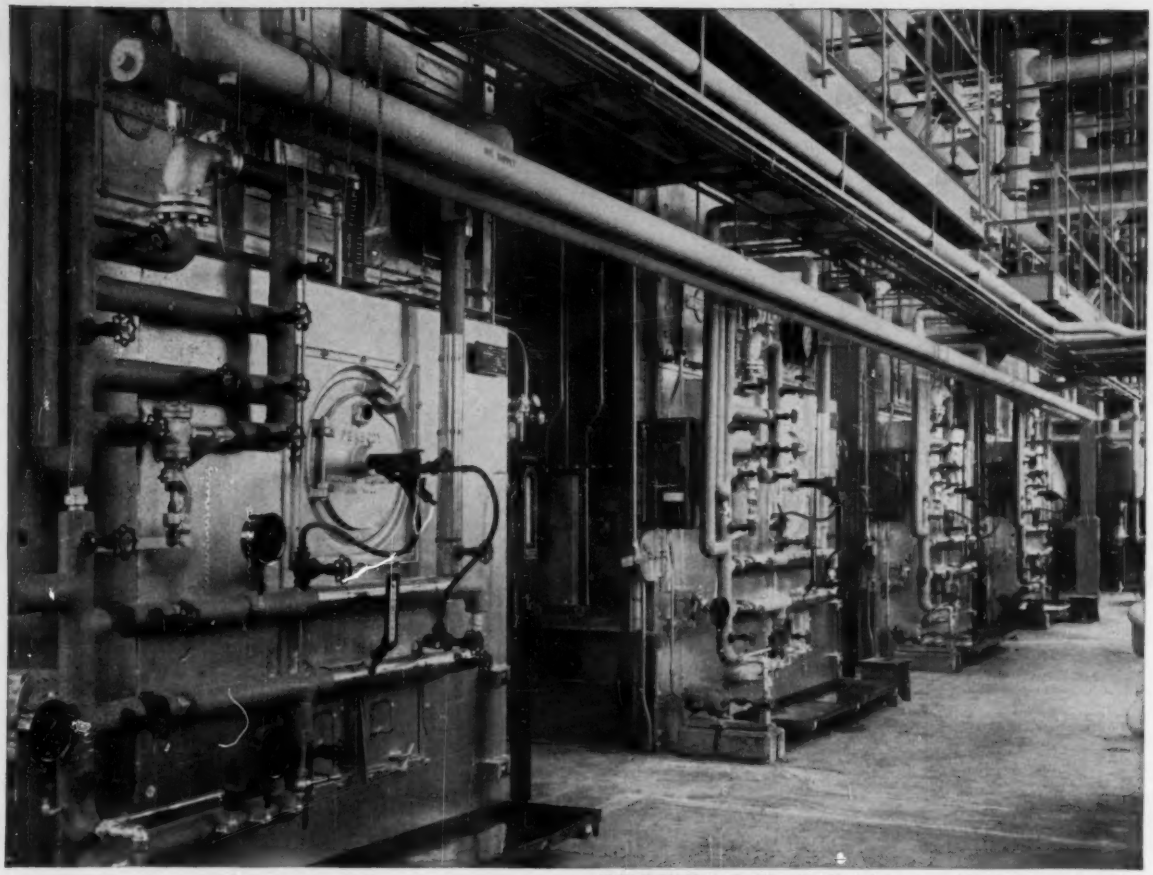


HEAT IS SAVED in this college building boiler room, as it has been in countless other applications for more than 65 years, by K&M "Featherweight"® 85% Magnesia insulation.

There's a full line of K&M Insulations to keep heating costs down

K&M "Featherweight" 85% Magnesia insulation in the illustration above is effective to 600° F., withstands moisture, vibration, frequent temperature changes. It lasts the life of the equipment it serves. There's a K&M insulation to suit any application.

Where temperatures range up to 1900°F.—K&M insulations efficiently keep heat where it's wanted, bring you important savings in heating costs.

These insulations are easily applied, dependable, and highly efficient within their respective ranges. Ask your K&M distributor for details about K&M insulations. Or write directly to us.

K&M LOW-PRESSURE INSULATIONS

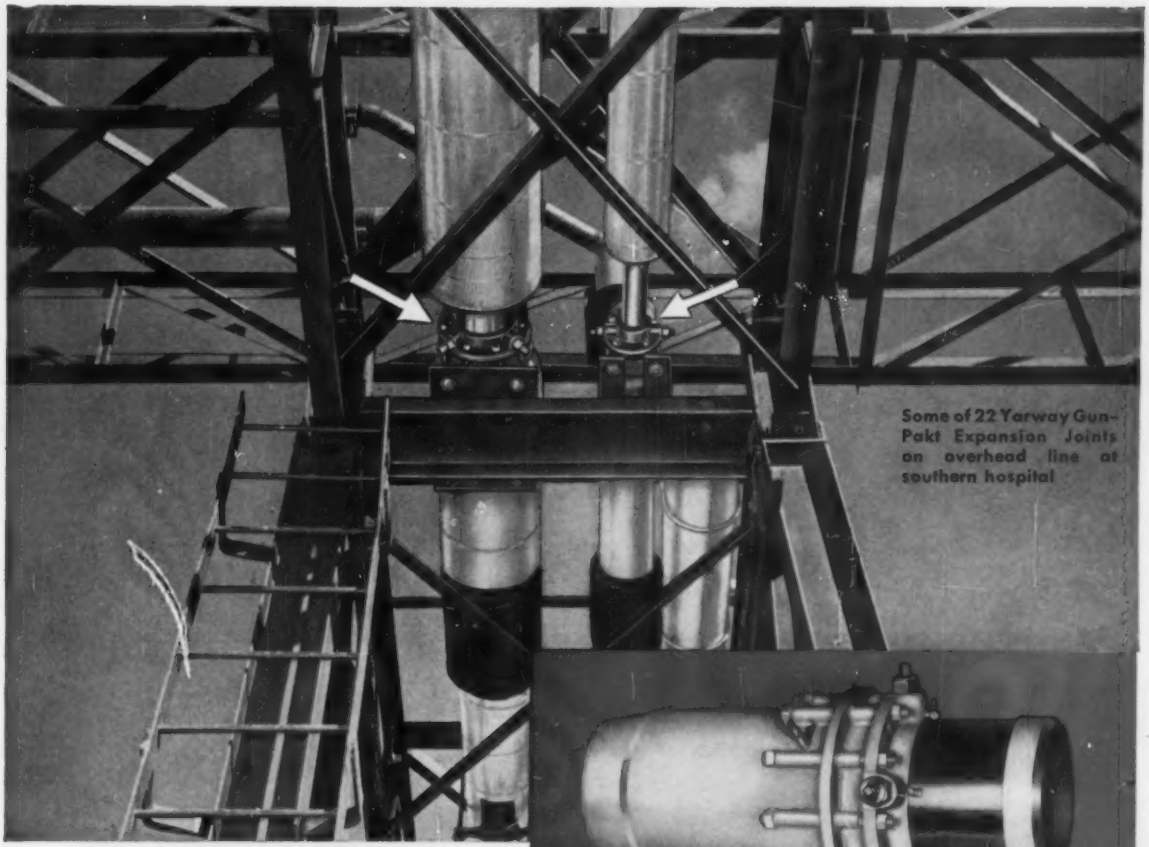
K&M Air Cell Pipe, Sheet and Block Insulation
K&M Fine Corrugated Air Cell Pipe, Sheet and Block Insulation
K&M Special Fine Corrugated Air Cell Pipe, Sheet and Block Insulation
K&M Simplex "Super Shrunk" Pipe Insulation
K&M Bestfelt Lamino Sponge Pipe and Block Insulation
K&M Duplex Pipe Insulation
K&M Nu-Wrap Non-Sweat Sectional Pipe Insulation
K&M Amblarex No. 2 Insulating Cement
K&M No. 152 Asbestos Finishing Cement

K&M HIGH-PRESSURE INSULATIONS

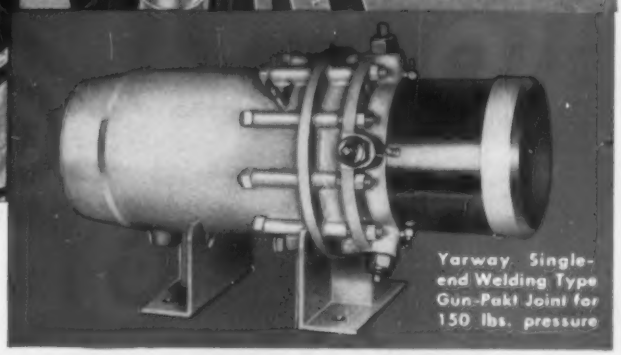
K&M "Featherweight" 85% Magnesia Pipe and Block Insulation
K&M Hy-Temp Pipe and Block Insulation
K&M "Featherweight" 85% Magnesia Cement
K&M Hy-Temp Cement
K&M KaytherM Block Insulation

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos®



Some of 22 Yarway Gun-Pakt Expansion Joints on overhead line at southern hospital



Yarway Single-end Welding Type Gun-Pakt Joint for 150 lbs. pressure

HOSPITAL FINDS GUN-PAKT *SURE CURE FOR EXPANSION JOINT TROUBLES*

YARWAY Gun-Pakt Expansion Joints are just what the "doctor" ordered for this overhead steam line at a large southern hospital—and he ordered 22 of them!

In institutions, industrial plants and other large steam distributor systems YARWAY Gun-Pakt Joints are growing in popularity.

YARWAY Gun-Pakt slip-type joints give long life—no fatigue failures.

You need *fewer joints per length of line,* with traverses up to 12″ single and 24″ double.

Gun-Pakt joints are *repacked under full steam pressure right on the job—no unpacking, no shutdowns.*

There's also *lower pressure load on end anchors* because excessive strains are eliminated.

All these are reasons why it will pay you to "do as the doctor ordered"—look into YARWAY Gun-Pakt Expansion Joints. Write for Bulletin EJ-1914.

YARNALL-WARING COMPANY
107 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

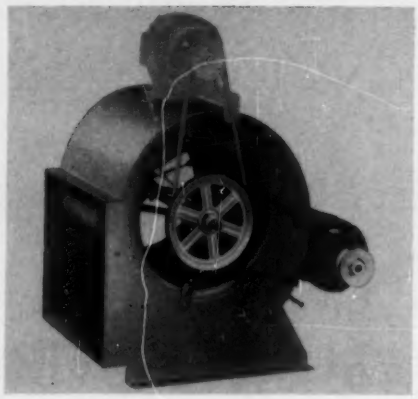
YARWAY **GUN-PAKT EXPANSION JOINTS**

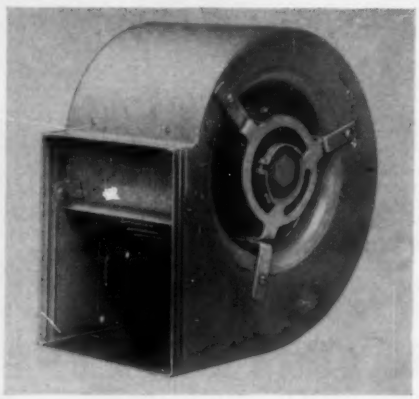
1. Direct Drive or Belt Driven

2. Complete Assemblies or Component Parts

In either case, leading original equipment manufacturers know from experience that

MORRISON BLOWERS...





. . . Are dependably "top quality" in construction and service.

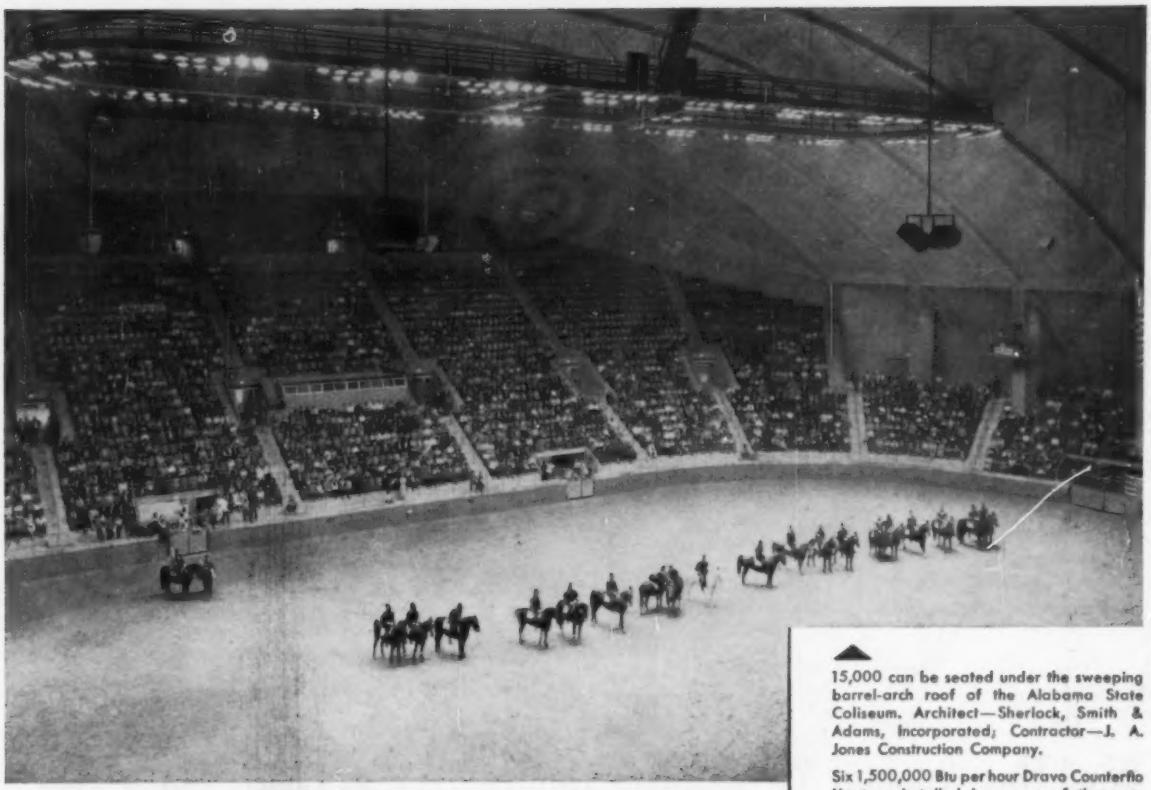
Morrison Blowers are correctly designed for your individual space requirements, meeting or exceeding all standards for the industry. They are rugged in construction—quiet in operation.

The wheels are double width, double inlet, standard diameter. Blades are one piece construction.

Ask us how many O.E.M'S are saving 50% of their Blower dollar investment. New Blower catalogs now available.

MORRISON PRODUCTS INC.

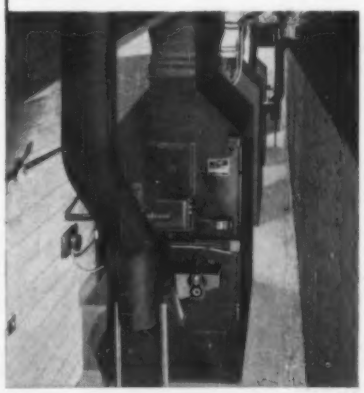
16816 Waterloo Road • Cleveland 10, Ohio



15,000 can be seated under the sweeping barrel-arch roof of the Alabama State Coliseum. Architect—Sherlock, Smith & Adams, Incorporated; Contractor—J. A. Jones Construction Company.

Six 1,500,000 Btu per hour Dravo Counterflo Heaters, installed in groups of three on opposite sides of the arena, operate automatically to provide heat as needed. A seventh Dravo Counterflo, rated at 500,000 Btu per hour, heats the basement.

How Alabama solved unusual heating problems in its new Coliseum



Keeping the new Alabama State Coliseum at Montgomery comfortable posed many unusual problems for heating engineers. Size alone presented a big enough problem—the building is 10 stories high and almost the length of an average football stadium—but added were many special conditions.

When the building is empty heat loss amounts to 9,800,000 Btu per hr, but when filled, body heat sometimes raises temperatures enough that heat and humidity must be removed. The large open area also makes it difficult to provide uniform, easily controlled heat at all seating levels. Other rigid requirements include concealment of heaters to permit unobstructed visibility and quiet operation. With the aid of seven Dravo *Counterflo* Heaters the engineers solved all these problems.

Installed under the stands of the arena are six Dravo heaters that pull in fresh and return air in proportion to the Coliseum's needs. This air is quickly heated by the Dravo units and quietly distributed to all parts of the building. Functioning with the heaters is a sensitive temperature-humidity control system that operates the heaters or a series of exhaust fans, according to on-the-spot heat-ventilation requirements. The fully modulated *Counterflo* Heaters, with their stainless steel combustion chambers, are ideally suited for this precise job of providing instantaneous heat delivery when needed—or fresh tempered make-up air when ventilation is required.

Just as they've economically solved the unusual heating problems in this huge Coliseum, Dravo heaters can effectively meet your needs, large or small. For fast proof, use the coupon.

Dravo Corporation, Department A-1412
Fifth & Liberty Avenues
Pittsburgh 22, Pa.
I am interested in Dravo Heaters for

_____

☐ Please send literature
☐ Please have a representative call

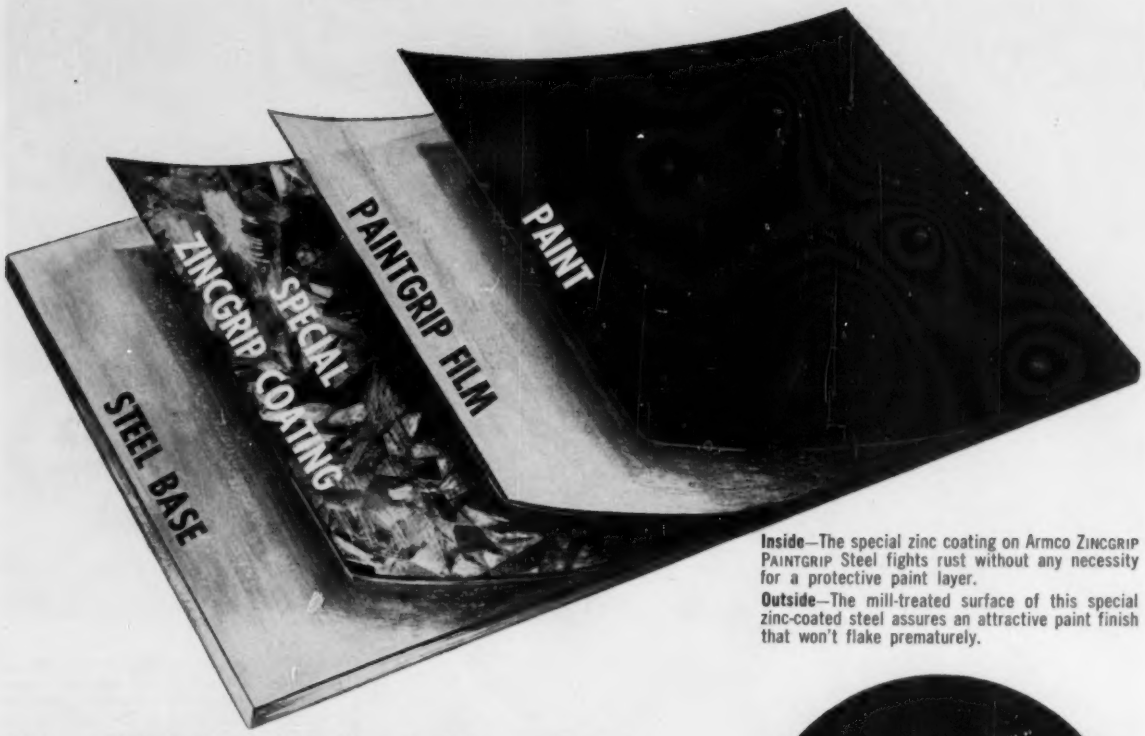
Name _____

Company _____

Address _____

City _____ Zone _____ State _____

DRAVO
CORPORATION
Pittsburgh 22, Pennsylvania
Representatives in principal cities



Inside—The special zinc coating on Armco ZINCGRIP PAINTGRIP Steel fights rust without any necessity for a protective paint layer.

Outside—The mill-treated surface of this special zinc-coated steel assures an attractive paint finish that won't flake prematurely.

Why This Special Steel Gives Ducts

Extra Protection

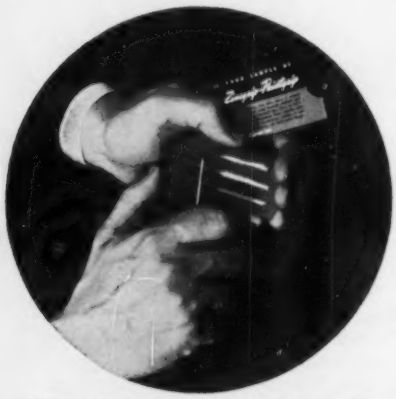
Here's why Armco ZINCGRIP PAINTGRIP Steel assures longer maintenance-free service for exposed ductwork in your heating and air conditioning installations:

Its mill-Bonderized surface holds paint much longer than untreated steel. And underneath the paint is a special zinc coating that gives unbroken rust protection.

This double rust protection for your heating and air conditioning ducts means more satisfied customers—longer service without replacement and costly maintenance. You can be sure there will be no premature flaking and peeling of paint.

You'll find this special steel is ideal in high quality casings too.

Let us send you more information about Armco ZINCGRIP PAINTGRIP. You can obtain this special steel from your nearby Armco Distributor.



This scratch test demonstrates ZINCGRIP PAINTGRIP's tight hold on paint. Paint on the untreated half of the panel flakes readily, while the paint on the ZINCGRIP PAINTGRIP half holds fast.

ARMCO STEEL CORPORATION
1375 Curtis Street, Middletown, Ohio
Send me more information on ZINCGRIP PAINTGRIP

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE___ STATE_____

ARMCO STEEL CORPORATION 1375 CURTIS ST., MIDDLETOWN, OHIO

SPECIAL STEELS

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

New Trend in Specifications!

...FITZGIBBONS *Packaged* BOILER UNIT

SINGLE RESPONSIBILITY
A factory integrated and completely wired unit with all equipment *coordinated* into a heating package that meets *design performance*. Fire tested before shipment with performance backed by Fitzgibbons.

REALISTIC RATINGS
Rated on the basis of 8.2 sq. ft. heating surface per boiler horsepower with guaranteed gross output based on 5.0 sq. ft. of heating surface per boiler hp.

CERTIFIED EFFICIENCY
Factory tests assure high operating efficiencies.

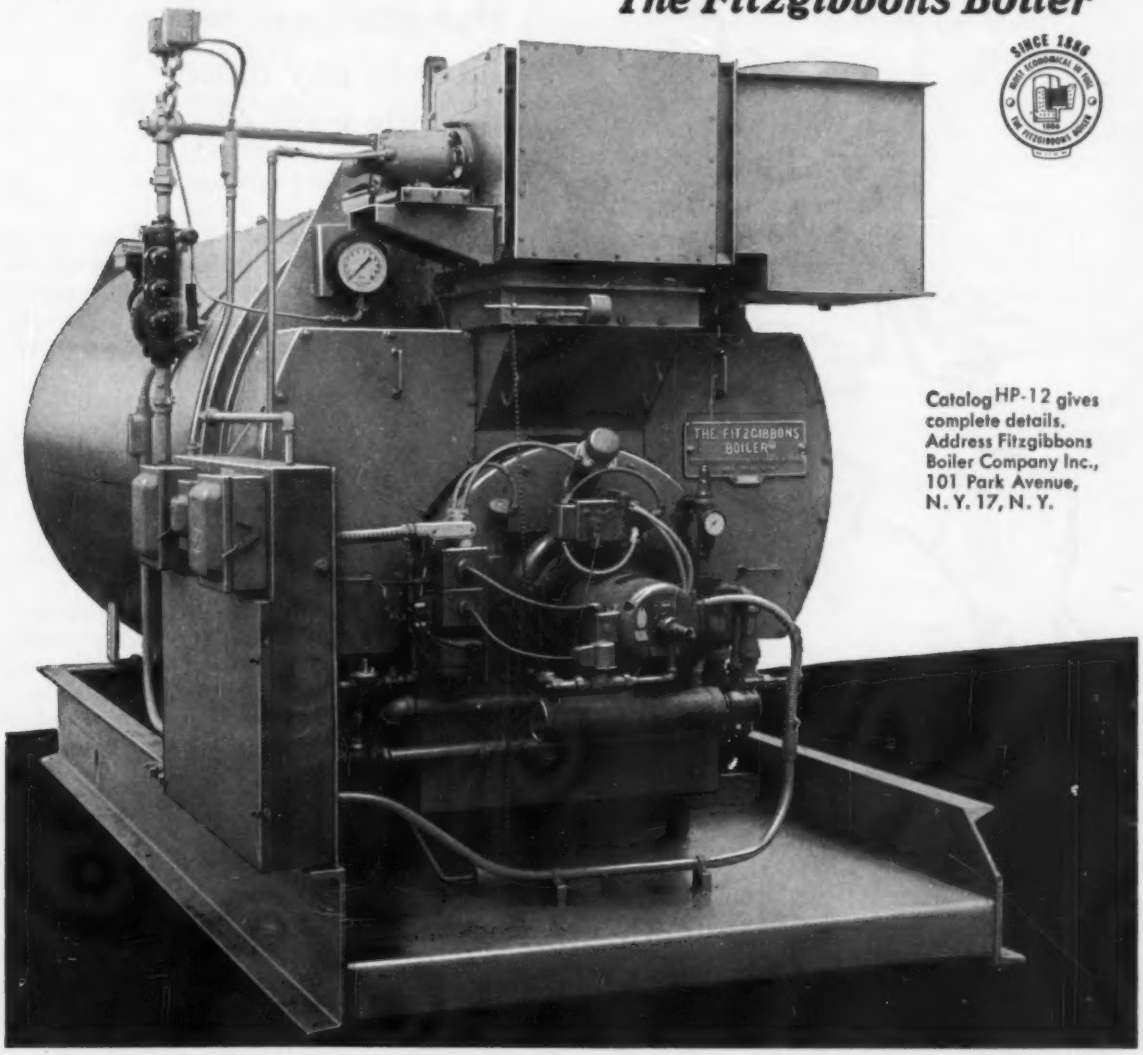
LOW COST MAINTENANCE
Full wet back construction of rear furnace walls (top, back and sides) eliminates rear refractory and recurring costs for maintenance and replacement.

FULLY AUTOMATIC
Latest and best control equipment for safe, sure operation with oil, gas or both.

CLEANER OPERATION
High quality induced draft fan assembly provides correct draft at all times and results in cleaner, quieter operation.

Engineered by the makers of . . .

The Fitzgibbons Boiler®



Catalog HP-12 gives complete details. Address Fitzgibbons Boiler Company Inc., 101 Park Avenue, N. Y. 17, N. Y.

Are those all the ashes for the day?

That's all! We're using a low-ash coal now. The analysis shows only one-half as much ash as the coal we had been using, and there is a great deal less unconsumed coke on the refuse.

But don't we have to pay more for this kind of coal?

Yes, we may pay more at the mine, but it costs us less delivered. Remember we used to pay freight on all those ashes and then pay to haul them away. And because there is so much more usable coal in each ton, we use fewer tons.

Who showed us how to make this saving?

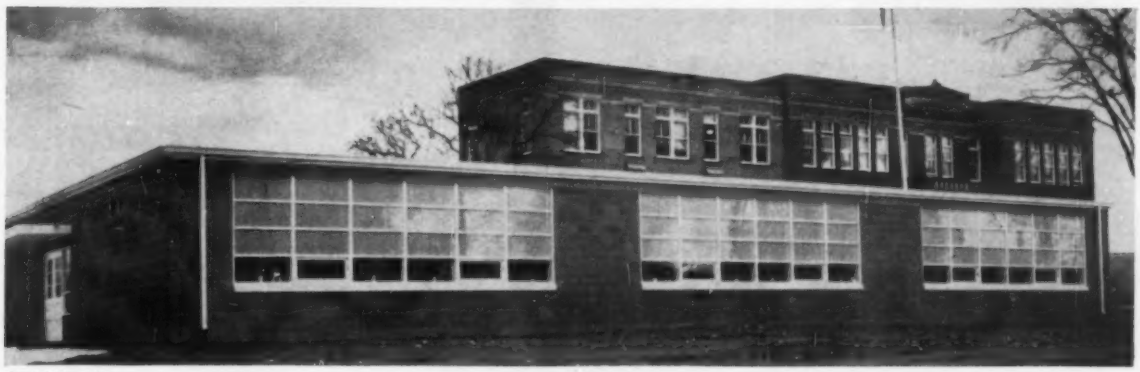
A C&O fuel service engineer gave us the facts and figures to show that this higher quality coal would really cost us less in the long run, and our experience has proved he was right. I am convinced now that you can't buy coal on price alone. It pays to get the advice of a competent combustion engineer and to pick the coal that will do the best job under your own set of conditions.

There's a lot more to buying coal than the cost per ton. Why not contact coal producers on the C&O to solve your particular fuel requirements, or write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Company, Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

GILSULATE® helps Wisconsin School build 5 modern classrooms for less than $55,000



Cadott School

"The installation of this material is so simple that it is almost unbelievable."

E. F. Klingler & Assoc., Eau Claire, Wisc.

Considering that most modern schoolroom construction costs average well over $30,000 per classroom, the low cost of the Cadott School is outstanding.

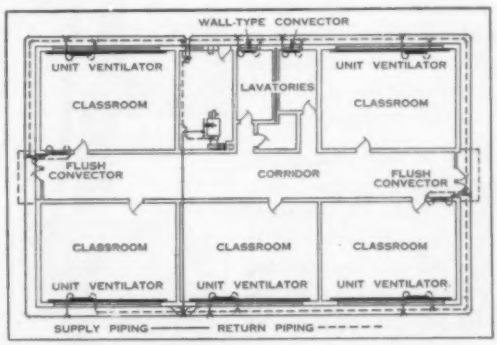
Several unique design features were incorporated in the building—among them, running steam and return mains about 6" outside the foundation lines of the building, eliminating costly crawl space or pipe tunnel construction.

For pipe insulation, E. F. Klingler & Associates chose GILSULATE. The pipes were covered with GILSULATE to a thickness of four inches on all sides, and backfilled. At the highest point in the lines, there are six inches of fill over the insulation and at the low point, about two feet. GILSULATE is so effective that at no time during the winter did the snow melt above the pipes—or even thaw the earth.

No other method for insulating and protecting hot underground pipes can match Triple-Zone GILSULATE for low cost of installation, efficiency and permanence. Fill in coupon below for complete details.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp...pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS**: no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING**: for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE:**
   Type A for 200°-310° F. temp. range
   Type B for 300°-385° F. temp. range
   Type C for 385°-520° F. temp. range



Cadott School floor plan

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-B West Broadway, Salt Lake City 1, Utah — or — 1145 East Jersey St., Elizabeth, N. J.

Send me more information on GILSULATE Insulation

NAME .....

TITLE .....

COMPANY .....

ADDRESS .....

HPA

for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

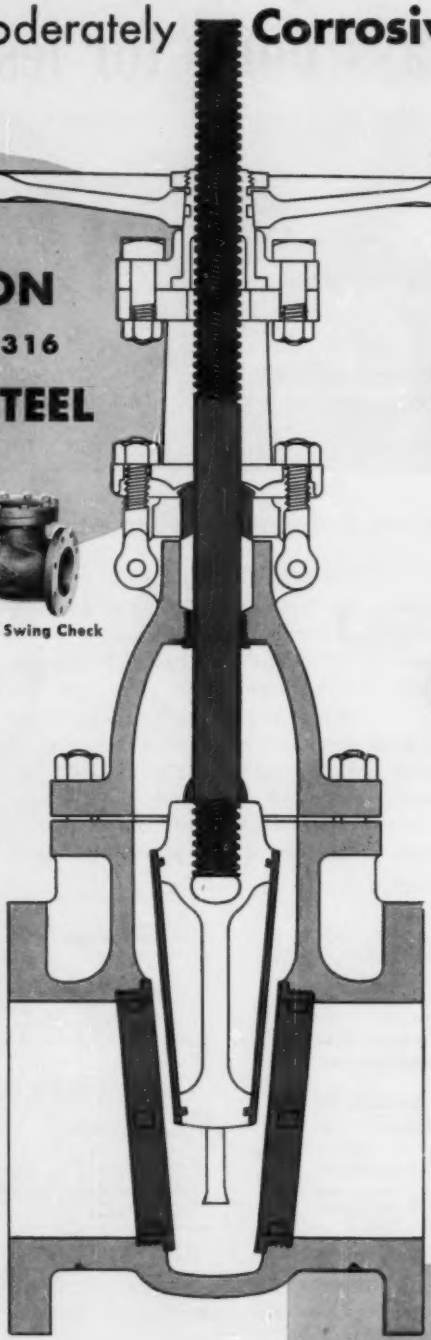
NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

Fig. 2624 Swing Check



Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2" to 4" sizes.
- **WEDGE** In 10" to 24" sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10" to 24" sizes.
- SEAT RINGS
- DISC and HANGER in Check Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2" to 8" sizes.

PRESSURE RATINGS

2" to 12"—200 lbs. O.W.G.
1¼" to 24"—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

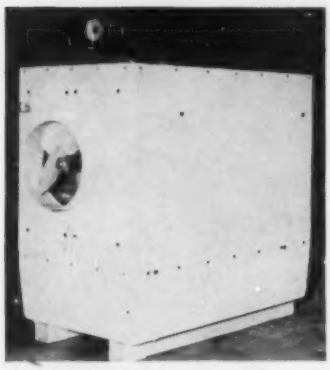
ALSO RECOMMENDED for fluids used in electroplating, photograph finishing, textile bleaching, dyeing and finishing and heat treating of metals.

GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.

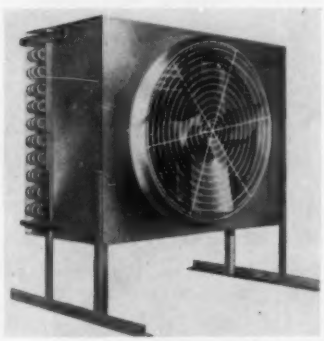
EQUIPMENT DEVELOPMENTS . . .

For reviews of Recent Trade Literature see Page 220



Cooling Towers . . .

. . .with glass fiber construction to resist rust, corrosion, deterioration—Baldwin-Ward Mfg. Co., Inc., 1630-44 S. Main St., Ottawa, Kan. Are light in weight, but are said to have three times strength of steel of equal weight. Molded by hand laminating process in three pieces: upper and lower water basins, main housing, fan housing. In capacities 3 to 10 tons.

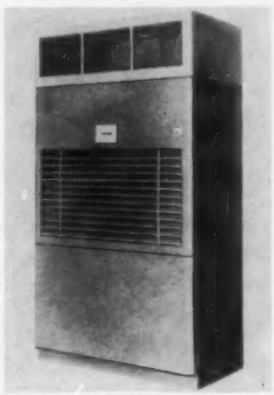


Air Cooled Condensers . . .

. . .in 2 to 20 ton size range—Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22. Slow speed, belt driven. Four blade, deep pitch fans are said to provide very quiet operation.

Water Heating System . . .

. . .designed to enable commercial laundries to increase their productive output without increasing present boiler capacity—Patterson-Kelley Co., Inc., East Stroudsburg, Pa. "Steam-Mizer" is said to eliminate periodic heavy steam demand, to even out boiler load, to insure steady steam supply at constant pressure to all equipment. Consists of water storage tank, combined condensate cooling and line steam heating section, circulating pump, all completely packaged, together with temperature regulator, pump controls, accessories.



Air Conditioners . . .

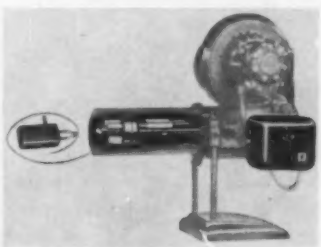
. . .in self contained packaged 3, 5, 7½, 10, 15, 20, 25, 30 ton models for commercial applications—Typhoon Air Conditioning Co., Inc., 505 Carroll St., Brooklyn 15. Also included in Company's 1956 line will be waterless air cooled line with two new condensing units with 8 and 10 ton capacities designed for commercial applications.

Template . . .

. . .designed to provide easy, fast way of drawing accurate broken lines—dot-N-dasher, P. O. Box 668. Cresskill, N. J. Made of transparent plastic. Is 12 in. long, 2¼ in. wide. Provides six different broken line patterns or stencils.

Filtration Process . . .

. . .for super cleaning atmospheric air with industrial type air filtration equipment—Wheelabrator Corp., 1321 S. Byrkit St., Mishawaka, Ind. May be used on applications formerly employing disposable or viscous filters or low voltage electrostatic precipitators. "Ultra-filtration" employs cloth filter type dust collectors. Process involves charging filter bags with filter aid which precoats filtering surfaces to provide matrix on which particles are collected. One application is said to last from two to three years under normal conditions.

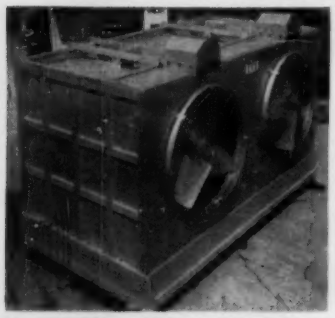


Oil Burner Controls . . .

. . .adaptable to all pressure type burners—General Controls Co., 801 Allen Ave., Glendale 1, Calif. "PerfX-ray" is said to be unaffected by soot or age, vibration or excessive heat. Has electromagnetic circuit, no tubes. Cited features: requires no leveling; does not interfere with air flow; eliminates stack wiring, stack mounting, stack control.

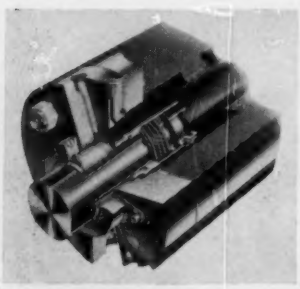
EQUIPMENT DEVELOPMENTS

Continued



Cooling Towers . . .

. . .in 3 to 250 ton capacity range —T O T Towers, Inc., 5220 Lawndale, P. O. Box 2564, Houston 1. Low head, gravity feed, induced draft type. Three to 8 ton models belt driven, with totally enclosed motors; 10 to 20 tons belt driven, with motor within casing and special water tight compartment; 25 to 125 tons belt driven with motor cover standard; 80 to 250 ton models have dual fans, motors. All have redwood fill. Casings are redwood and marine bond plywood.

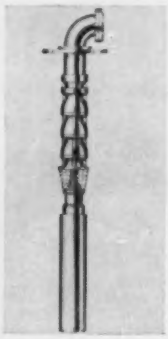


Mechanical Seals . . .

. . .for use on process pumps—Garlock Packing Co., Palmyra, N. Y. Cited features: one piece assembly, preset at factory, collett type drive, external lock and drive, circulating connections in glands. Designed for use on rotary shafts of boiler feed pumps, chemical pumps, oil refinery pumps, digestor circulating pumps, other process pumps.

Portable Air Filter . . .

. . .designed to be compact in size, quiet in operation—Radex Corp., 2076 Elston Ave., Chicago 14. For commercial, residential use, installation requires merely plugging into wall socket. Uses activated carbon filter. "Smog-Free" draws contaminated air through 2 in. aluminum filter located on backside of cabinet. As air filters through screen, dirt and dust particles are removed. Air passes through activated carbon filter to absorb gases, odors, other vaporlike impurities.



Booster Pump . . .

. . .designed to meet rigid requirements of industrial, municipal pump users—Layne & Bowler Pump Co., 2943 Vail Ave., Los Angles 22. Cited features: oversize shaft, longer bearings with protective caps, perihedral impeller seals, mechanical shaft seal designed for submerged service, choice of either mixed flow or radial flow impellers. In models 5 to 150 hp, with discharge heads 50 to 500 ft, 100 to 4000 gpm capacity.

Electric Motors . . .

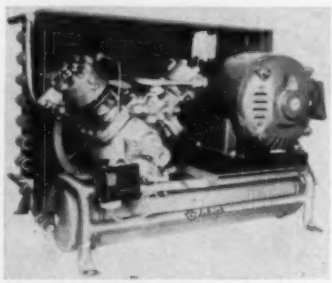
. . .with fractional horsepowers for light industrial shops, other uses—Emerson Electric Mfg. Co. of St. Louis, 8100 Florissant Ave., St. Louis 21. Line includes 18 types ranging ¼ to 1 hp, in sleeve and ball bearing construction. Are split phase and capacitor start motors with speed ratings either 1725 or 3500 rpm.

Boiler . . .

. . .for small commercial buildings, clinics, similar installations—Crane Co., 836 S. Michigan Ave., Chicago 5. Is said to fill gap between large commercial and small residential boilers. Primarily oil fired, may be adapted to gas or coal.

Dust Control Unit . . .

. . .designed to remove microscopic solids, fumes, odors from exhaust gases at 99 percent efficiency—Johnson-March Corp., 1724 Chestnut St., Philadelphia 3. Collects dust by hydro-compressing exhaust gases through a system of multiple tubes into a water chamber. This produces scrubbing action. Violent water agitation set up causes secondary pressure turbulence and additional scrubbing in tube chamber. In 15 sizes ranging 500 to 40,000 cfm.

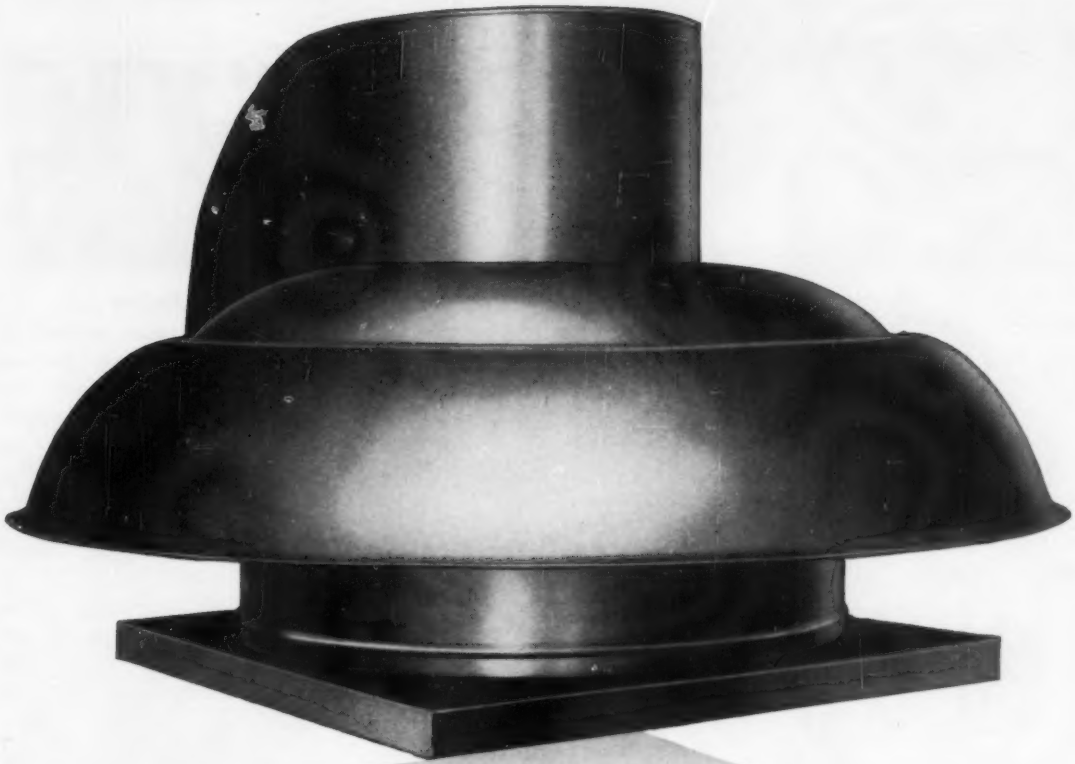


Tubular Base . . .

. . .new feature of company's open type condensing units—Lehigh Mfg. Co., Lancaster, Pa. Is change in design of bases in 1/3 to 3 hp air, air-water, water cooled models. Replaces conventional steel base with iron legs. Cited advantages: increased air flow over receiver for faster, greater liquid subcooling; greater accessibility to all compressor and motor bolts; easier cleaning of complete unit; less overall weight of unit.

Cutoff Machine . . .

. . .for ⅜ to 1¼ in. tubes—Continental Machine Co., 1952 N. Maud Ave., Chicago 14. Is said to produce up to 2000 cuts per hr, depending



NEW CENTRIFUGAL ROOF VENTILATOR
. . . QUIET RUNNING, LOW SILHOUETTE

For whisper-quiet operation on schools, hospitals, etc. Runs at low speeds, moves large volumes of air efficiently against static pressure. Low in silhouette, distinctively profiled, blends well with modern architecture.
Send for new 16-page catalog which also contains a section, "How to Select a Roof Ventilator."

De Bothezat FANS
A DIVISION OF
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS, Dept. HP-1255
Division of American Machine and Metals, Inc.
East Moline, Illinois

☐ Yes, please send me catalog on your new Centrifugal Roof Ventilator.

FIRM NAME

ADDRESS

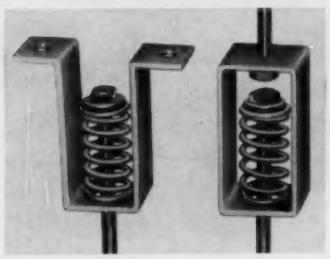
CITY ZONE STATE

ATTENTION MR.

EQUIPMENT DEVELOPMENTS

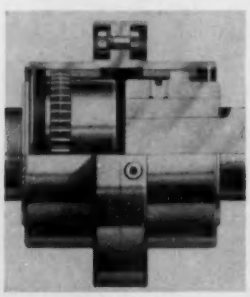
Continued

on diameter, wall thickness, length. Cutting wheel driven by ¼ hp, 115 volt a/c gear head motor, operated by overload protected starting switch. Chief speed advantage of unit, says company, is that wheel cutting action is through wall thickness rather than entire diameter of material.



Vibration Hangars . . .

. . . designed to prevent transmission of noise, vibration from suspended equipment, and to flexibly support piping systems—T. R. Finn & Co., Inc., Industrial Div., Hawthorne, N. J. Consist of helical steel spring enclosed in steel housing. Rated load capacities range 50 to 1000 lb.

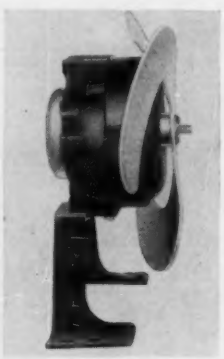


Dihedral Coupling . . .

. . . designed to handle misalignment to 3 deg between driving and driven shafts of direct connected machines —Ajax Flexible Couplings Co., Inc., Westfield, N. Y. Feature is tooth design which makes possible to have close tooth clearance as contrasted to ordinary gear type couplings which are dependent on backlash for handling misalignment, says company. Load normally carried at center of tooth. Under maximum rated misalignment driving force is carried across an entire half tooth.

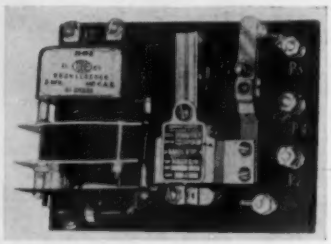
Spray Valve . . .

. . . for use with company's deaerating heaters, hot process softeners—Graver Water Conditioning Co., 216 W. 14th St., New York. Features parabolic plug of special construction designed to provide constant flow angle under all conditions. Plug facilitates unvarying, even spray pattern with pressures and flow rates ranging 3 to 150 percent of rating, says company. Stainless steel constructed.



Motor . . .

. . . designed for almost universal replacement versatility—Morrill Motors, 3100 Fairfield Ave., Ft. Wayne, Ind. Typical cited applications are condenser cooling in commercial refrigerators and freezers, low temperature air circulation in commercial frozen food cabinets, circulation in dehumidifiers, beverage coolers, room air conditioning and ventilating equipment. In ratings 1/500 to 1/80 hp at speeds 1200 to 1550 rpm.



Differential Relay . . .

. . . designed to operate on small voltage, frequency variations—Automatic Switch Co., 391 Lakeside Ave., Orange, N. J. Is said to "dropout" at 80 to 93 percent of "pickup" voltage with frequency held constant. Smaller differentials may be obtained if required. Available open or enclosed, one or two poles, normally open or normally closed.

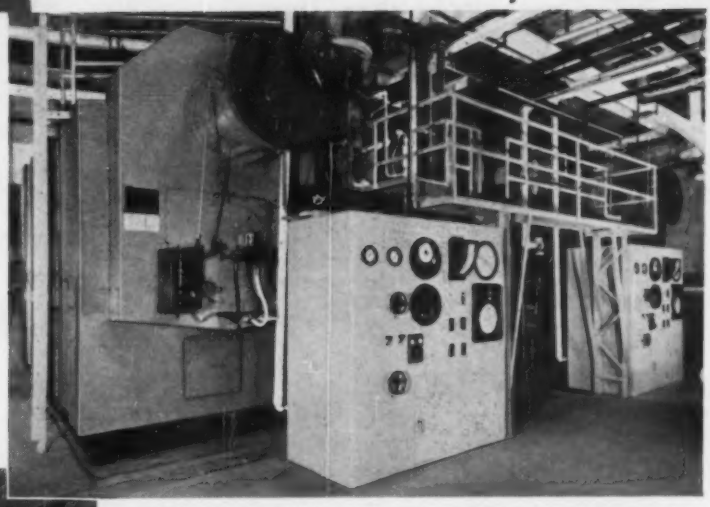
Centrifugal Pump . . .

. . . designed for greater volumetric capacity, reduced net positive suction head—Eco Engineering Co., 12 New York Ave., Newark 1. Accomplished by increasing suction port size from ¾ in. to 1 in. pipe thread while retaining ¾ in. discharge port. Features teflon-ceramic shaft seal for corrosion resistance. Pumps available with closed or semi-open impellers. Can be opened for cleaning without removal from line. May be rotated 360 deg within their mounting brackets to permit incorporation into existing systems.

Water Softeners . . .

. . . for manufacturing plants, institutions, commercial establishments—Hagan Corp., 323 Fourth Ave., Pittsburgh 22. Available as packaged units. Require only connections to fit into water system. Resinous exchange material provided with each

keeping steam cheap...



"Home" of the two, B&W Type FM Integral-Furnace Boilers is in the basement of the Service Building. Francisco & Jacobus, Engineer & Architect for the Service Center.

2 B&W FM Boilers Serve 5 Buildings at LONG ISLAND LIGHTING'S NEW SERVICE CENTER

With its residential load centered in an area where new home construction is booming, the Long Island Lighting Company has always anticipated load growth far in advance. The most recent example of this policy is the creation of the new service center in Hicksville, N. Y.

Covering 78 acres, the center includes a headquarters group of six buildings (providing 200,000 sq. ft. of floor space), huge storage facilities, parking space for almost a thousand cars, and even a helicopter landing strip. When three more planned buildings are completed, the center will contain about everything needed to operate the service end of a modern utility.

The steam requirements for all but one of the buildings is supplied by two B&W Type FM Boilers. Each unit is capable of generating 20,000 lb of steam per hr at 125 psi. Normally burning gas, the FM Boilers are equipped with combination burners and controls that permit changing over to oil in a matter of seconds and without substituting equipment. Automatic control, with on-off operation for low loads, is another important operational and economy feature of these versatile, self-contained boilers.

Satisfaction with the performance of B&W Integral-Furnace Boilers—both FMs and FFs—operating at other Long Island Lighting locations—was a strong factor in the choice of a dual-unit FM installation for the new service center. Along with other utilities and a broad range of industrial, commercial, and institutional users, Long Island Lighting has found the Type FM Boiler ideally suited to its needs. The strong acceptance of this unique boiler is indicated by the total steam capacity of more than 10,000,000 lb per hr of the units now in service or on order. It is available in standardized sizes for loads ranging between 2900 and 40,000 lb of steam per hr at pressures to 235 psi—may be obtained for higher pressures and with moderate superheat. *Write for Bulletin G-76A for the complete details of this unusual small boiler with an illustrated description of its cost-saving features. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.*

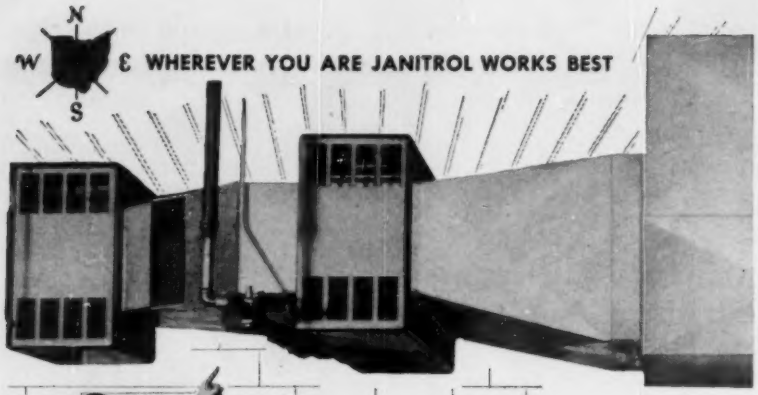
COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

BOILER DIVISION

G-702



"Our Janitrols save us over 40% in fuel costs"

Says Mr. C. J. Mayle, President, Fremont Tool & Die Co., Fremont, Ohio, comparing Janitrol Unit Heaters with oil-fired steam heat used previously.

Here's how Janitrol engineers and equipment solved all of Mr. Mayle's tough heating problems.

● Bothersome drafts, caused by the exhaust of heated air in the removal of abrasive dusts, were eliminated by bringing in outside air, "tempered" by Janitrol DUCT Heaters. The Dura-tube heat tubes in the DUCT units minimized the corrosive effects of condensation caused by the cold outside air.

● The 'Surface' Industrial Processing Furnaces, "big brothers" to the Janitrol line, made warm spots in the shop area. Individual Janitrol Unit Heaters, with separate thermostats, provided uniform, zoned comfort throughout.

● Economical year 'round office comfort was obtained by using the same duct system for summer cooling and winter heating. The plant is ventilated in summer by the unit heater blowers.

These Janitrol Units temper the outside air which is brought in to replace the heated air exhausted in abrasive dust removal.

It is not only the superiority of Janitrol design, but also the training of its engineer-representatives who integrate and balance this equipment to meet your problem. For new, or remodeling advice, send these problems to us. No obligation.

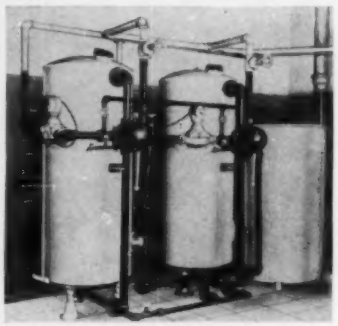
®Janitrol Gas-Fired
UNIT HEATERS

DIVISION OF SURFACE COMBUSTION CORPORATION
400 DUBLIN AVE., COLUMBUS 16, OHIO

MAKERS OF SURFACE INDUSTRIAL FURNACES AND KATHABAR HUMIDITY CONDITIONING

EQUIPMENT DEVELOPMENTS

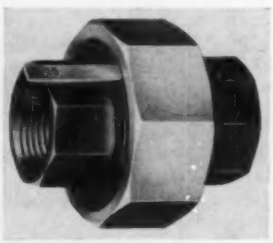
Continued



units. Require only connections to softener tank, with controls and piping in place. Also available as twin unit. Flow rates to 175 gpm for single unit, with regenerations ranging to 1,500,000 grains.

Subsurface Washer . . .

. . . designed to combat certain backwash difficulties occurring in filtration, ion exchange materials—Graver Water Conditioning Co., 216 W. 14th St., New York 11. Is being used with success in demineralizers, zeolite softeners, filters experiencing excess fouling of beds, says company. Breaks up solids, removes them to prevent fouling, permits effective backwashing at normal rates.



Tab Orifice Union . . .

. . . for instrumentation, process control piping—Watson-Stillman Fittings Div., H. K. Porter Co., Inc., P. O. Box 95, Roselle, N. J. Orifice size stamped on tab that protrudes through slot in end piece of union to eliminate errors in orifice plate identification. Orifice plate removable when it is desired to change flow conditions. Connecting pipes need be pulled back only enough to slip plate from between union ends.

Dry air saves brewery $10,000/yr.

Before: A familiar view of fermentation tanks without Kathabar humidity conditioning

After: Kathabar humidity conditioning eliminates condensation, adds maintenance savings to its other benefits.

One of our best-known breweries recently saved an extra $10,000 a year in its fermentation cellars, by using Kathabar units instead of cooling units.

Previously, condensation damage forced them to repaint their cellars every 3 years at a cost of as much as $40,000. They figure that their Kathabar system – which dries air below the condensation point – eliminates every other painting.

But that's only part of the story. Brewery officials expect less routine maintenance and fewer wash-downs. Corrosion of piping and instruments is eliminated. Building life will be extended.

Kathabar humidity conditioning has proved its cost reducing capacity in several of the largest breweries. Put it to work earning for you.

write for the complete brewery story today

Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

LIGHT • VERSATILE • TIMESAVING

Here's a new tool that's so chock full of uses it is difficult to list all of them. Though originally designed as a means of power to operate pipe threading tools, it is a highly desirable unit for many other uses. For example: Opening and closing large valves, winching operations, pulling wire through conduit, hoisting operations, operating augers, cranking operations. The PORT-A-PONY is a powerful portable power drive that will greatly reduce manual labor. Weighs only 26 pounds. Rugged construction, sturdy reversible ½ H.P. motor. Send today for new colorful bulletin on the "TOLEDO" No. 68 PORT-A-PONY with all applications illustrated. Remember—if it bears the familiar "TOLEDO" label, you know it's a dependable product. Manufactured by Thread-Ezy Mfg. Co., Subsidiary of The Toledo Pipe Threading Machine Company, 1445 Summit Street, Toledo 4, Ohio.

TOLEDO No. 68
PORT-A-PONY
POWER PIPE THREADER
WEIGHS ONLY 26 lbs.

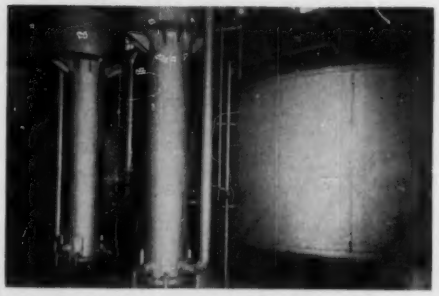
BUILDERS OF THE WORLD'S FINEST PIPE TOOLS
TOLEDO
PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES

THREADIO PIPE

NEW
PORT-A-PONY

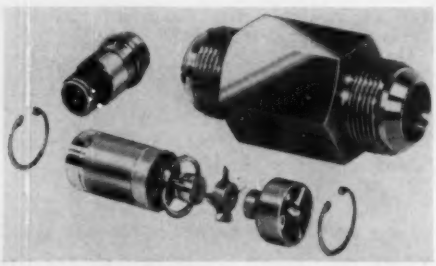
EQUIPMENT DEVELOPMENTS

Continued



Nonchemical Aeration Process . . .

. . . designed for high iron removal—Aquatrol Ferr-X Corp., Clifton, N. J. Filtration system operates as follows: Raw water enters aerator with measured compressed air through two separate diffusers at bottom of aerating column. Water, air then pass upward through calibrated packing in aerator column to obtain greatest surface contact. Upper portion is disengaging chamber and small retention tank where gases are separated, released by level control equipment. Water then passes into filter where all filterable solids removed, says company.

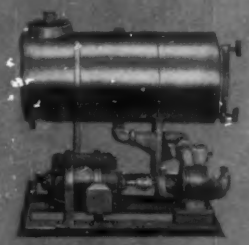


Turbine Flow Meter . . .

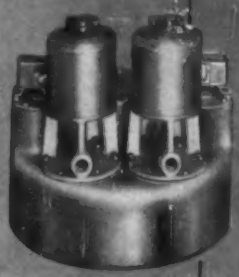
. . . designed to give precise flow rate measurement (± one-half of 1 percent of rate) up to 100,000 lb per hr at specific gravity 1.0—Fischer & Porter Co., Hatboro 35, Pa. Range is 20:1. Accuracy not affected by pipe configuration, says company. Maximum pressure drop is 7 psi. Consists of fluid driven rotor mounted in short housing installed in pipe line. Rotor turns at speed directly proportional to fluid velocity. Magnetized blades of rotor induce electrical pulse. Number of pulses proportional to speed of blade rotation, number of blades.

Vapor Defrosting System . . .

. . . designed for use without external heat sources—Refrigeration Engineering, Inc., 7250 E. Slauson Ave., Los Angeles 22. "Vapomatic" uses heat of compression and "never runs out of heat," says company. "Vapot" heat exchanger is said to improve capacity of compressor and efficiency of whole system during freezing cycle.



"TM" TURBINE PUMP
Designed for boilers up to 250 hp and discharge pressures up to 150 lbs.



"UV" CONDENSATE PUMP
Capacities ranging from 2,000 to 40,000 sq. ft. EDR, and discharge pressures from 10 to 75 lbs.

"CV" VERTICAL PUMP
Heavy duty duplex unit with two float switches. Capacities ranging from 500 to 10,000 sq. ft. EDR and discharge pressures from 10 to 20 lbs.

"CVS" VERTICAL PUMP
Capacities ranging from 500 to 10,000 sq. ft. EDR and pressures from 10 to 40 lbs.

Skidmore Pumps

PEAK EFFICIENCY

. . . AT LOW COST!

"HS" CONDENSATE PUMP
Capacities ranging from 1,000 to 65,000 sq. ft. EDR and discharge pressures from 10 to 75 lbs.

TYPE HS CONDENSATION PUMP
Write for Bulletin No. 14-A

Cost less to install!
Cost less to operate!

Here's a condensate pump that spells savings from the very start . . . year after year of operating cost, is still less than similar type pumps.

Write for bulletins or contact the nearest Skidmore representative for complete engineering data.

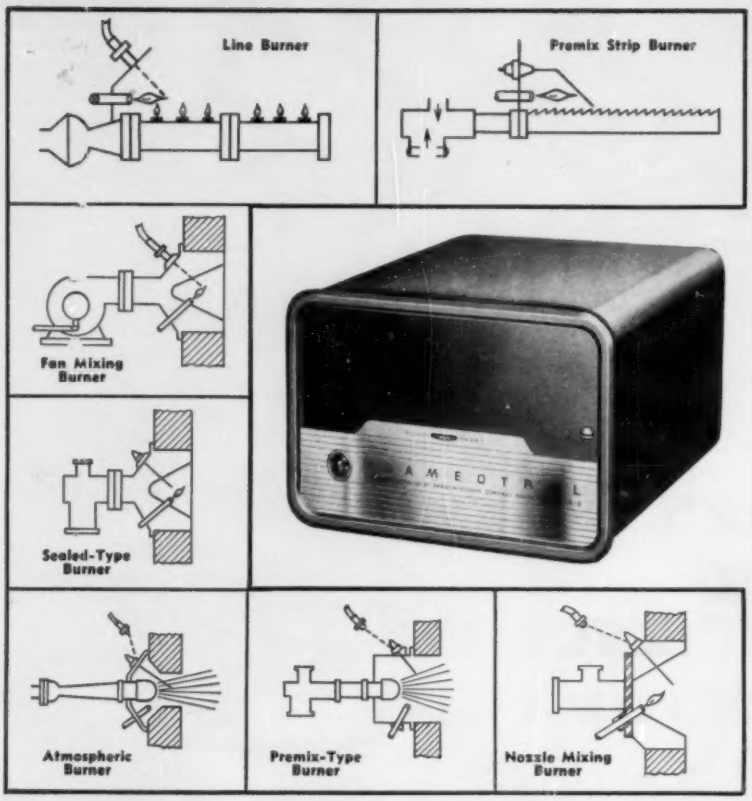
SKIDMORE PUMPS

Skidmore has been Synonymous with Quality and Engineering Leadership, Since 1921.

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

BARBER COLMAN

Wheelco Flame-otrols



Versatile combustion safeguard for positive protection of gas and oil burners!

Use any type of burner — any fuel or combination of fuels — Wheelco can provide complete flame supervision with dependable, electronic combustion safeguard systems. All conventional industrial-type sensing systems are available from this single source, so Wheelco engineers can recommend and supply complete flame detection and control systems for oil and gas fired furnaces, ovens, boilers, kilns, and dryers.

According to requirements, one of two widely used Wheelco systems will give reliable service. The Series 1470 Conductive-Rectification System uses the ability of a flame to conduct electrical current to protect manually or semi-automatically (pushbutton start) ignited gas, oil, or combination fuel burners. In gas firing, the flame is the medium for both rectification and conduction, with a rod pickup. Oil fired applications use an emissive-type photocell, activated by flame luminosity for rectified flame response.

Also available is Series 1570 Infrared System which depends on the fluctuating current of a flame frequency for relay response. A lead-sulphide, photo-conductive cell predominantly sensitive to infrared energy is used as a flame pickup for IR Systems. This system can be used with either oil or gas fired equipment.

All Wheelco Systems offer the advantages of compact plug-in design, heavy-duty construction, safety-type terminal strips, standard electronic tubes, and convenient checking strips. Your Wheelco field engineer is well-equipped to assist you in the selection of a combustion safeguard system to suit any problem.

WHEELCO INSTRUMENTS DIVISION

Barber-Colman Company

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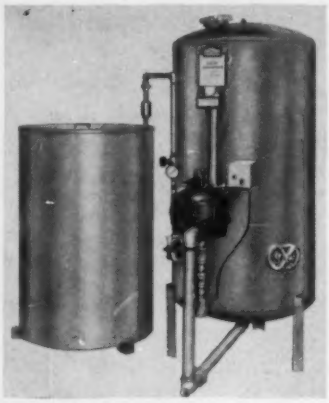
BARBER-COLMAN OF CANADA, LTD., Dept. X, Toronto and Montreal, Canada

Industrial Instruments • Automatic Controls • Air Distribution Products • Aircraft Controls • Small Motors
Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

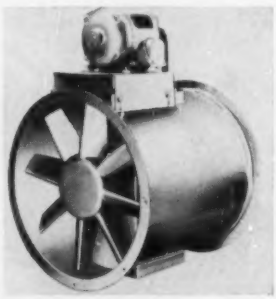
EQUIPMENT DEVELOPMENTS

Continued



Water Softeners . . .

. . . in new commercial series—Bruner Corp., 4763 N. 32nd St., Milwaukee 16. In four models. Smallest has 1¼ in. pipe size. Other three use 1½ in. sizes. Flow rates range 20 to 50 gpm. Feature disc type, water lubricated multiport valve that cycles through four positions of backwash, brine and slow rinse, rapid rinse, service.



Heavy Duty Fan . . .

. . . incorporating new aerodynamic design features—Chicago Blower Corp., 9869 Pacific Ave., Franklin Park, Ill. Features new type wheel. Large hub approximates diameter of motor to reduce air turbulence. Tapered blades with airfoil section are said to give smoother air stream flow with higher percentage of air delivery over full length of blade. In eight models.

Filter . . .

. . . with accelerated action, lowered air resistance—Barnebey-Cheney Co., Columbus, Ohio. For use in room

THE MARK OF QUALITY

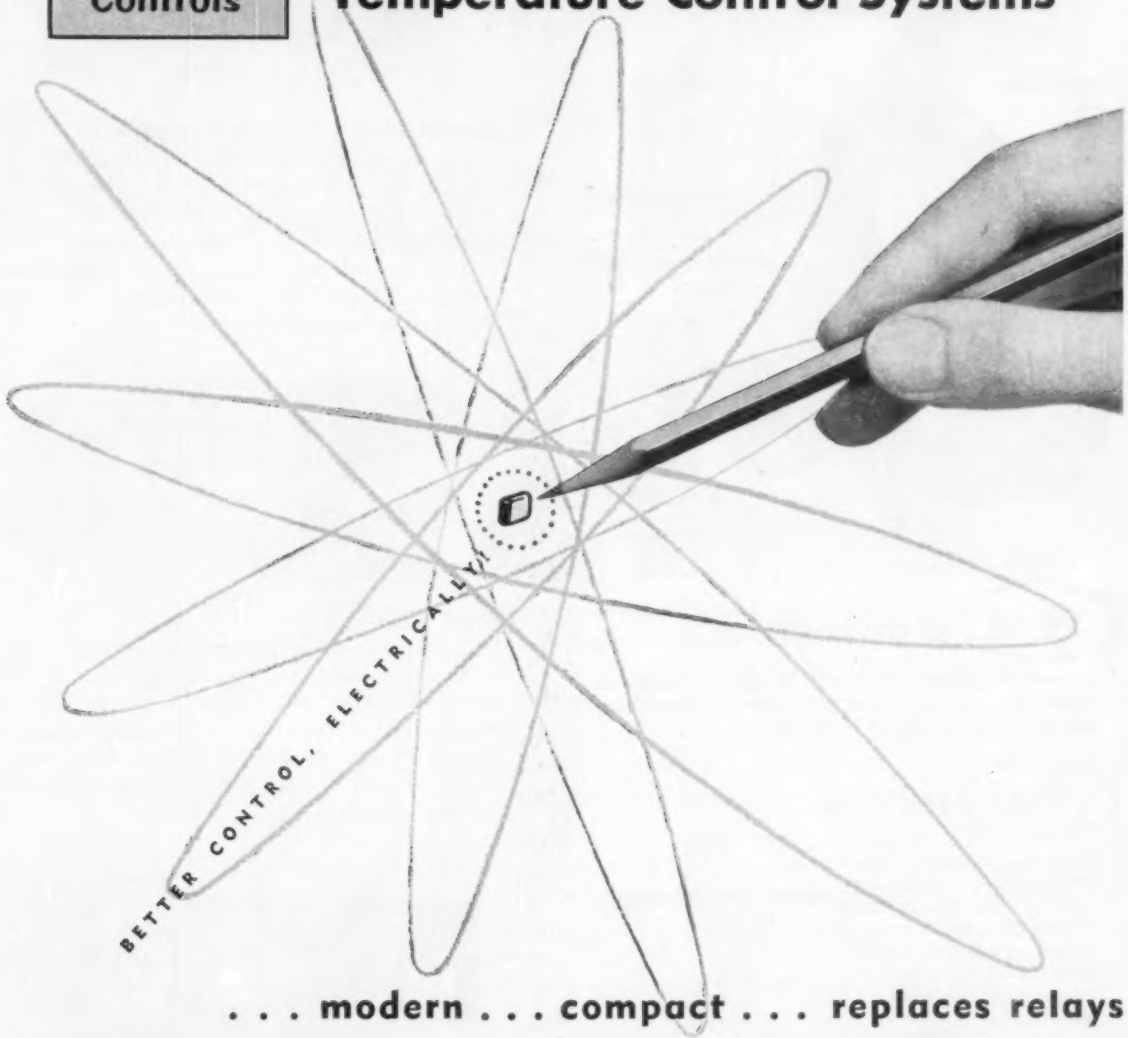
BARBER COLMAN

ELECTRIC-ELECTRONIC

Automatic Controls

NOW... Transistor Relay

used in Barber-Colman Temperature Control Systems



. . . modern . . . compact . . . replaces relays several times its size . . . get data on up-to-date control systems from nearby field office . . . another "first" from . . .

Barber-Colman Company

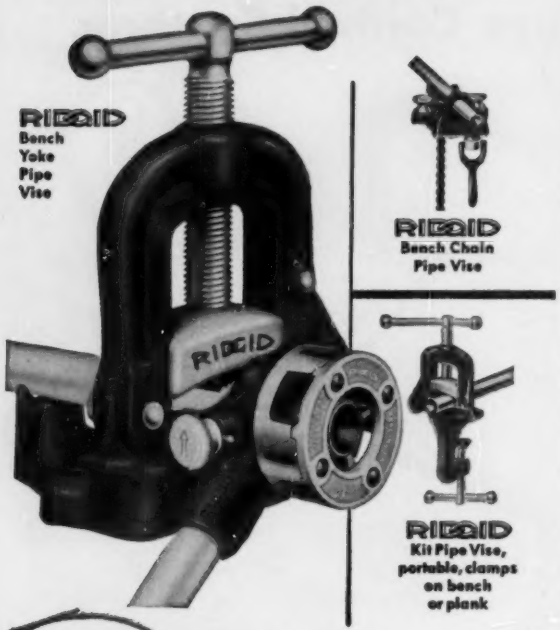
DEPT. X, 1301 ROCK STREET ROCKFORD, ILLINOIS

You get *More* for your money when it's a work-saver

RIDGID

Yoke or Chain Type

Bench, Kit or Post Pipe Vise



***More* efficiency...**

special design jaws that grip firmly . . . close and open fast . . . pipe rests for more accurate threading, easy cutting . . . handy pipe benders.

***More* service...**

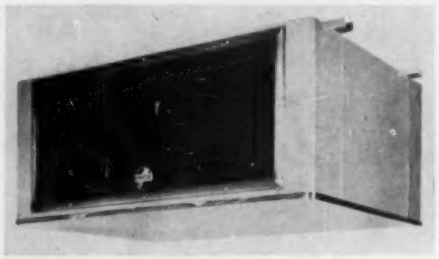
famous RIDGID heat-treated jaws for extra long wear . . . special malleable frames that won't warp or break . . . every vise factory tested to assure you super-performance and durability.

Get most for your money... buy RIDGID Vises, including stand and tristand, at your Supply House!

The Ridge Tool Company • Elyria, Ohio • U.S.A.

EQUIPMENT DEVELOPMENTS — *Continued*

air coolers, forced air furnaces. Fiber reinforced activated charcoal strips in gridwork are said to provide increased exposed charcoal surface area to boost rate of adsorption.

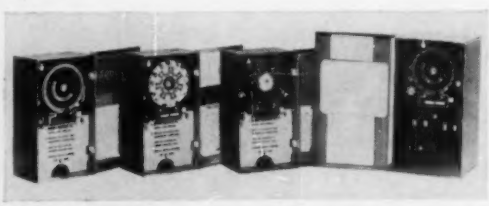


Remote Type Air Conditioners . . .

. . . designed for quiet operation—Refrigeration Appliances, Inc., 903 Lake St., Chicago 7. Primarily for ceiling suspension, but may be installed on floor. Available without cabinets for furred-in installation. Adaptable for use with duct systems. In two double blower models with 3 and 5 ton nominal capacities, one single blower model with 2 ton capacity.

Stud Welding Gun . . .

. . . for in the field welding of steel studs to 1¼ in. in diameter—Bakelite Co., a Div. of Union Carbide and Carbon Corp., 260 Madison Ave., New York 16. Pistol grip stock less bulky, says company, because is molded of glass filled "Bakelite" phenolic resins, which are said to have high heat resistance, good electrical properties.



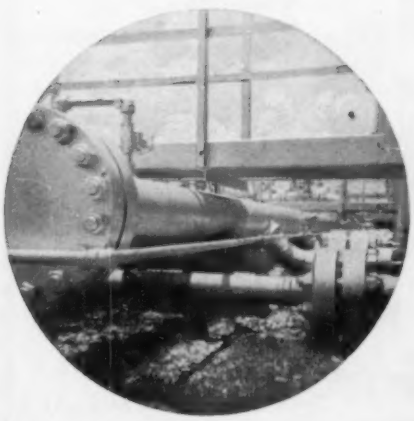
Time Switches . . .

. . . standardized in company's line—Tork Clock Co., Inc., Mount Vernon, N. Y. Cataloged under series "1191," designed to aid engineers, contractors in selection. Includes 24 hr, seven day, atronomic, "Skip-A-Day" models. Cited applications: motors, fans, machines, heating controls, auxiliary control of magnetic contactors, motor starters, solenoid valves.

4500 psi Recycling Plant

$ 18,000 SAVED on branch connections alone!

By requesting the alternate use of Weldolet Welding Fittings in all weights and sizes the piping contractor was able to lower his bid sufficiently to be awarded the job!



This recently completed recycling plant in Louisiana was designed and engineered in full accordance with the ASA and ASME Codes and operates at a maximum pressure of 4500 psi and 225°.

The piping engineers on this job were confronted with a number of tough problems. The plant was to be operated at extremely high pressures. The terrain was swampy which meant the fittings had to withstand the additional stresses exerted by a settling foundation. The piping also had to stand up under rugged vibration conditions. The many design features of Weldolet Welding Fittings in both full size and reducing size outlets provided the safe, practical and most economical answer to these knotty service problems.

WELDING FITTINGS DIVISION

BONNEY FORGE & TOOL WORKS

715 MEADOW STREET, ALLENTOWN, PENNA.

internal swivel action
gives you two-way control over movement of piping

With the Blaw-Knox functional spring hanger, you can readily control both lateral and longitudinal swing movements of hanger rod up to 7 degrees.

For the hanger is designed with the Blaw-Knox patented *internal swivel action*, which permits movement while the hanger case itself remains vertical. Larger movements are readily accommodated by overhead roller assemblies. Each is a complete packaged unit ready to install.

In fact, our entire line of rigid hanger assemblies, overhead roller assemblies, vibration eliminators, as well as the functional spring hangers and constant support spring hangers are furnished as complete units . . . thereby saving engineering time and eliminating expensive cutting, threading and assembling in the field.

Our engineers, who have had years of experience, are available to both design and make recommendations for your hanger requirements.

BLAW-KNOX COMPANY
Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania

Send for your copy of Bulletin No. 54 to get complete information

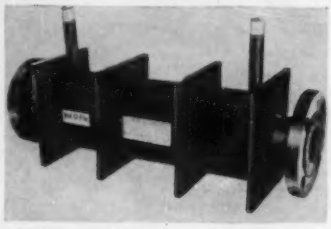
BLAW-KNOX

PIPE HANGERS

Complete line of functional spring hangers • constant support spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated piping systems for all pressures and temperatures

EQUIPMENT DEVELOPMENTS

Continued



Gas Flow Element . . .

. . . based on principle of linear pressure drop set up by viscous flow of fluids in thin channels—National Instrument Laboratories, Inc., 6108 Rhode Island Ave., Riverdale, Md. Is all metal unit so arranged as to provide multiplicity of flow channels in which Reynolds number is kept below 400 at full scale flow. Develops differential pressure indication linearly proportional to volumetric flow. Standard flow ranges are 0.003 to 100 cfm for steam and most common gases at pressures 1 in. Hg abolute to 2000 psig.

Spray Nozzle . . .

. . . for central system air conditioners —Carrier Corp., Syracuse 1. Is said not to clog regardless of amount of lint or other fine foreign matter in air. Employing orifices of special design, flexible material, nozzles "spit out" obstructions impeding flow of water to be atomized, says company. Will become standard equipment in all of company's spray type air conditioners.

Air Valve . . .

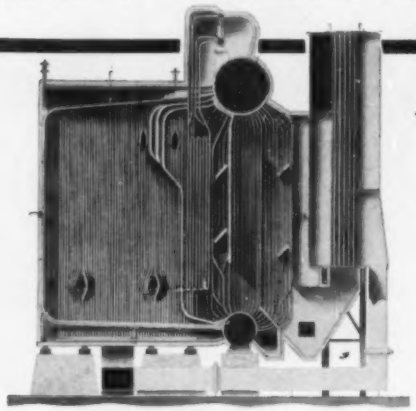
. . . with three-way solenoid pilot operation—Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9. "S-3" series offers positive bubble tight shutoff, is noncorrosive throughout,

one of these C-E standard boilers is . . . .

DESIGNED FOR YOUR PLANT

If your steam needs range between 4,000 and 120,000 pounds per hour, one of these versatile C-E Boilers will give you economical, standout performance. For while they are standard in design (which means lower first cost and proven performance), they're still *flexible* enough to be easily adapted to meet almost any standard requirement.

Chances are that one of the C-E standard boilers is the answer to your steam needs. But whatever they may be, C-E can fill them. For C-E Boilers are made in sizes and types for *any* capacity—for *any* pressure—*any* fuel or method of firing.

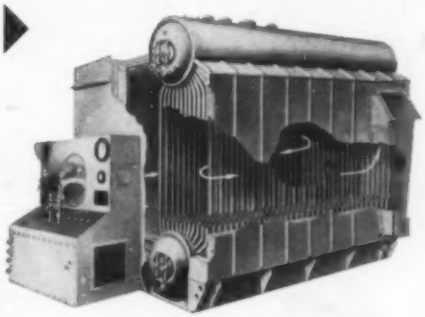


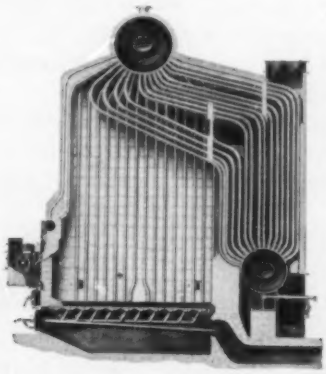
C-E Vertical Unit Boiler, Type VU-55

The VU-55 Boiler is available in six sizes ranging from 50,000 to 120,000 lb of steam per hr. It is designed for two pressure ranges—up to 250 psig and to 500 psig. These units are arranged for the application of superheater surface and heat recovery equipment if desired. VU-55 Boilers are designed for the pressure firing of oil or gaseous fuel and require no induced draft fan. They are equipped with tangential burners and tangent tube furnace walls to assure a level of performance which compares favorably with modern utility practice. The VU-55 Boiler is bottom supported requiring no supporting steel structure. The absence of exterior ductwork permits a smooth, streamlined exterior which is both attractive and practical.

C-E Package Boiler, Type VP

This completely shop-assembled boiler is available in fourteen sizes from 4,000 to 40,000 pounds of steam per hour . . . for operating pressures up to 500 psi . . . for pressure firing of liquid or gaseous fuels. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large lower drum—30-inch diameter—permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. A centrifugal fan, which operates at low speed and is exceptionally quiet in operation, is standard equipment. The simple baffle arrangement results in low draft loss . . . simple soot blowing . . . no dead pockets . . . high heat absorption. The VP is enclosed in a reinforced gas-tight, welded steel casing, and shipped completely assembled with firing equipment, fittings and forced draft fan. For foundation, it needs only a simple concrete slab.





C-E Vertical Unit Boiler, Type VU-10

The VU-10 is available in nine sizes from 10,000 to 60,000 pounds of steam per hour . . . for operating pressures up to 475 psi . . . superheat to 200° F in 20,000-60,000 lb range . . . for solid, liquid, or gaseous fuels. This boiler is a completely standardized design adaptable to many conditions. It is bottom-supported and needs no outside supporting steel. It operates efficiently over a wide range of output, and is easy to operate and to maintain. All parts are easily accessible for inspection. The VU-10 is a complete unit—boiler, furnace, setting, fuel-burning equipment, controls, forced draft, heat recovery equipment (if desired). Regardless of fuel, the same general cross-sectional arrangement of drums, convection bank and furnace wall cooling is used. Uniform design through each transverse section assures even water level in the drum and uniform expansion.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

CANADA: COMBUSTION ENGINEERING-SUPERHEATER LTD.

STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; DOMESTIC WATER HEATERS; SOIL PIPE

C-E

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PLAN YOUR PROCESS PIPING for

MAXIMUM SERVICE and SAFETY with . . .

WATSON-STILLMAN
Socket-Welding
FORGED STEEL FITTINGS

In high pressure steam lines...process liquid and gas piping...hydraulic fluid lines...wherever strong, tough pipe joints are needed, Watson-Stillman Socket-Welding Fittings provide a safety factor against costly piping failures. Drop-forged of high quality steel, they readily resist pressure, heat, corrosion, shock and vibration.

W-S Socket-Welding Fittings are easy to install. Deep sockets support and align the pipe for welding. No need for tack welding or special fixtures. And the outside-the-pipe fillet weld prevents welding icicles inside the pipe.

Watson-Stillman Forged Steel Fittings are available in carbon, stainless and alloy steel for Schedule 40, 80, 160 and XX pipe. Sizes ⅛" to 4". A complete line of forged screw-end fittings is also available.. Send today for Free catalogs.

Sold Through Leading Distributors

WS WATSON-STILLMAN FITTINGS DIVISION

HKP H. K. PORTER COMPANY, INC.

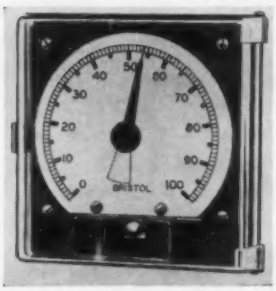
Roselle, New Jersey

11

EQUIPMENT DEVELOPMENTS

Continued

says company. Designed for operation on air clutches, air brakes, power feeds, other pneumatic equipment. Operates without springs. By rotating pilot head, valve can be used normally open or normally closed. Has low amperage solenoid coil that operates on most a-c, d-c voltages (with power consumption of 10 watts maximum), directs spool, solenoid plunger. For pressures 30 to 150 psi.



Telemeter Receivers . . .

. . . for use on graphic panel arrangements—Bristol Co., Waterbury, Conn. Are available either as indicators or strip chart recorders. Occupy only 5 sq in. panel space. Designed to fit into company's metagraphic instrument line, can be used to receive telemetered signals of any of usual variables.

Pressure Control . . .

. . . for use as air fuel interlock switch in packaged steam generators —Henry G. Dietz Co., 12-16 Astoria Blvd., Long Island City 2, N. Y. Is safeguard to prevent flow of fuel when hazardous conditions present due to lack of forced draft. May

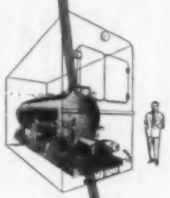
CYCLOTHERM
CYCLONIC COMBUSTION

The most efficient method of combustion in steam generation!

Cyclotherm Steam and Hot Water Generators
18 to 500 hp
15 to 200 psi

Unequalled Heat Transfer Efficiency!

Cyclotherm Cyclonic Combustion guarantees a minimum 80% efficiency in oil and/or gas. Utilizes the largest possible heating area in the firetube. A flaming vortex spirals the length of the firetube. A thin layer of air prevents flame impingement . . . localized "hot spots" . . . and heat-retarding scale.



The Most Advanced Design!

Cyclotherm Cyclonic Combustion achieves its high heat transfer rate in only 2 passes. Permits a simplified design that reduces maintenance costs as much as 50%. Cyclotherm is as much as ⅓ smaller than other packaged units.

Completely Assembled On Arrival!

Factory-tested Cyclotherm costs less to ship because it's lighter in weight. Factory-insulation with fiberglas saves you up to $500 or $600. Installation requires only 5 connections. All parts necessary for safe, efficient, economical operation are supplied.

Automatic In Operation!

Electronic controls halt the Cyclotherm burner whenever operation is interrupted. A factory-pre-set water-level control automatically insures a sufficient supply of water always in the boiler. A low water cut-off control stops operation if the water supply is interrupted.

This free, information-packed booklet tells how Cyclotherm will help you achieve savings in time, costs and space. MAIL THIS COUPON TODAY!

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CYCLOTHERM®
Steam & Hot Water Generators

Cyclotherm Division, National-U.S. Radiator Corp.,
2625 E. First Street, Oswego, New York

Please send me your free booklet which shows me how I can save time, money and space with Cyclotherm.

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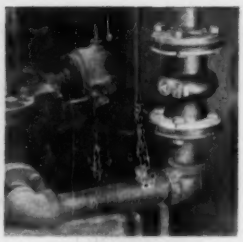
Garlock rubber expansion joint on vacuum line between turbine and condenser

Expansion joint operating on suction side of centrifugal pump handling condensate from condenser



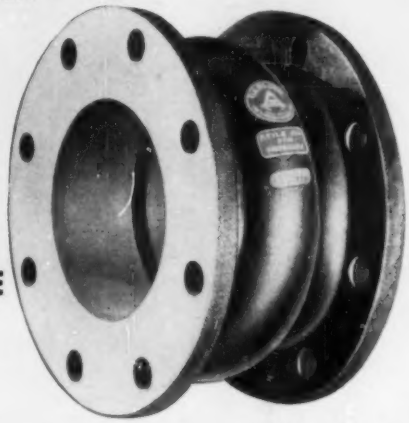
Expansion joint operating on condensate pump discharge line

STOP NOISE,

VIBRATION, and

FLANGE BREAKAGE

WITH



GARLOCK EXPANSION JOINTS

GARLOCK rubber expansion joints absorb vibration and compensate for linear expansion and contraction of pipe lines. They stand up under repeated flexing—do not crack or fracture.

These flexible joints are used to prevent transmission of sound and to absorb vibration in air conditioning and water lines in commercial, institutional, and industrial buildings. Wear and tear on pipe flanges is reduced to a minimum.

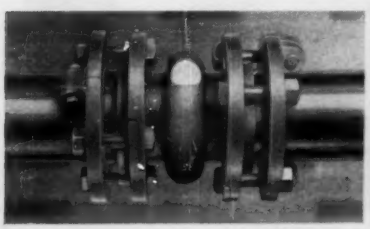
GARLOCK **Rubber Expansion Joints** are made for all pipe sizes ¾" to 72". **All "Teflon" Joints** or **Rubber Joints with Teflon liner** are made for chemical service; **Neoprene Joints** for oil service.

For complete information, write today for Folder AD-137.

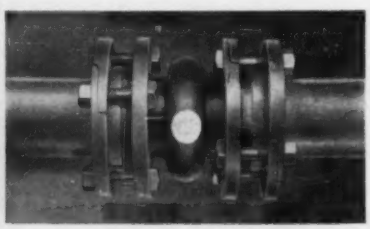
THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

Sales Offices and Warehouses: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Los Angeles, New Orleans, New York City, Palmyra (N.Y.), Philadelphia, Pittsburgh, Portland (Ore.), Salt Lake City, San Francisco, St. Louis, Seattle, Spokane, Tulsa

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.



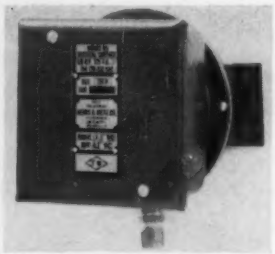
Garlock expansion joint applied to pipe made by Haveg Corp.



Garlock expansion joint applied to pipe made by The Duriron Co., Inc.

EQUIPMENT DEVELOPMENTS

Continued



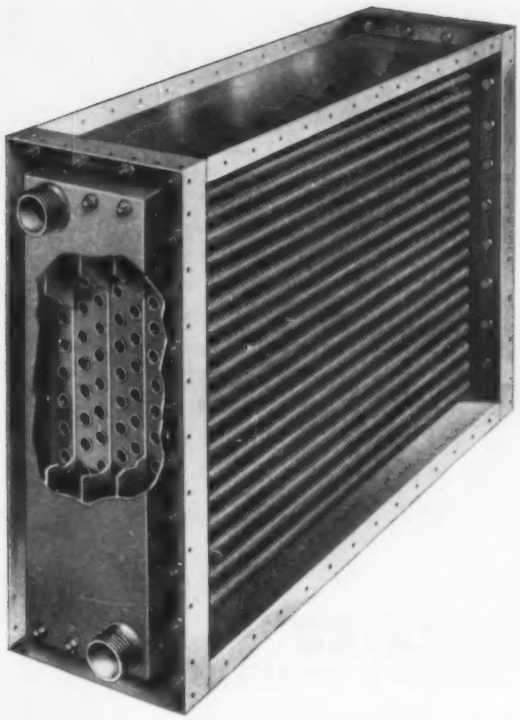
also be used in forced air cooling of electronic or air conditioning equipment where blower failure would cause damage due to overheating, says company. Adjustable over 0.1 to 0.5 in. water column static pressure. Rated 15 amperes at 120-250 volts a-c, ⅛ hp or 125 volt amperes pilot duty.

Motors . . .

. . . designed for same horsepower in less space, reduced weights—Electro Dynamic Div., General Dynamics Corp., Bayonne, N. J. Low air opening in end bell is said to protect winding from liquids, abrasive dust. Standard ratings available in rerated NEMA frame sizes 182, 184, 213, 215, 254U, 256U. Balance of sizes will extend to 40 hp, 3600 rpm.

Pump . . .

. . . with portable, air-motor driven design—Vanton Pump & Equipment Corp., 201 Sweetland Ave., Hillside, N. J. Self priming chemical and slurry type. Is said to be explosion-proof for handling hazardous liquids. Has no stuffing box or mechanical seal leakage. Use of air motor offers wide range of variable speed operations, says company. Capacities to 20 gpm, pressures to 50 psi.



AEROFIN TYPE R REMOVABLE-HEADER WATER COILS

• Complete Drainability
• Easily Cleaned
• High Heat Transfer

Completely drainable and easily cleaned, Aerofin Type "R" coils are specially designed for installations where frequent mechanical cleaning of the inside of the tubes is required.

The use of ⅝" O. D. tubes permits the coil to drain completely through the water and drain connections and, in installations where sediment is a problem, the coil can be pitched in either direction. The simple removal of a single gasketed plate at each end of the coil exposes every tube, and makes thorough cleaning possible from either end.

The finned tubes are staggered in the direction of air flow, resulting in maximum heat transfer. Casings are standardized for easy installation.

Write for Bulletin No. R-50.

AEROFIN CORPORATION

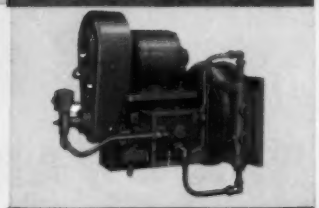
101 Greenway Ave., Syracuse 3, N. Y.

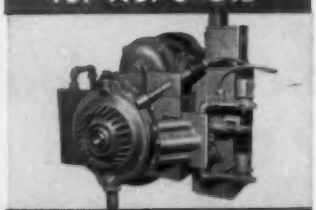
Aerofin is sold only by manufacturers of fan system apparatus. List on request.

SUPERIOR ROTARY BURNERS

. . . provide dependable manual, semi-automatic, or fully automatic operation . . . burning light or heavy oils, natural or manufactured gas. For new installations and conversions in all types of heat receivers; for heat, process steam or power.

Developed primarily to achieve the complete combustion which results in the highest efficiencies with the greatest economy of fuel, these rugged burners insure years of dependable trouble-free operation. For complete details write for Catalog 2604.





Note THESE SOUND FUNDAMENTALS:

- Time-tested horizontal-rotary design.
- V-Belt Drive for the high cup speed essential to efficient atomization.
- Four-Hole Hinge circulates oil through oil heater so that hot oil is on the *pressure* side of the pump, allowing you to burn oil at higher temperatures.
- Adjustable Air Nozzle provides accurate control of flame contour.
- Dual Pumps and Reservoir combined with Constant Oil Rate Control provide controlled firing regardless of viscosity variation.
- Burn any grade of oil. Also available with combined gas burner for any type of gas.
- Fully automatic in sizes to 600bhp with dual ignition, and hi-low or fully modulating control.

for performance you can **BANK** *on*

SUPERIOR ROTARY BURNERS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

EQUIPMENT DEVELOPMENTS

Continued

Portable Pump-Motor . . .

. . . designed for lightness, compactness—Jabsco Pump Co., 2031 N. Lincoln St., Burbank, Calif. Has dry suction lift of approximately 15 ft. Consists of stainless steel self priming pump mounted directly onto shaft of ¼ hp, 1725 rpm electric motor. Uses neoprene impeller with ½ in. inlet, outlet ports designed to accommodate standard piping. Operates on 115 volts a-c, 60 cycles, single phase. Capacity is 10 gpm against 10 ft head. For use at pressures to 20 psi.

Tube Expanders . . .

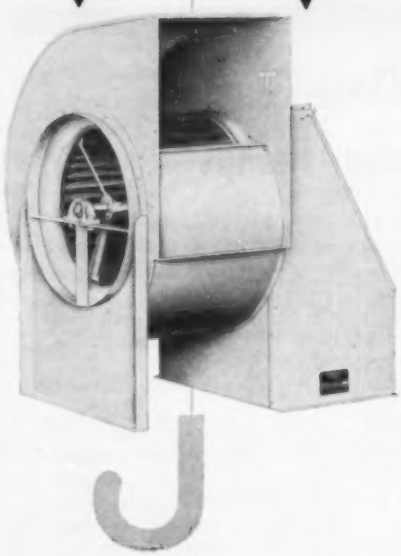
. . . designed to roll tubes as small as ¼ in., 20 gage—Elliott Co., Lagonda Div., Springfield, Ohio. With ball thrust bearings. Added to company's line of expanders for condenser, heat exchanger tubes.

Proportioning Pumps . . .

. . . designed for increased efficiency, to be lighter in weight and more compact—Proportioneers, Inc., 345 Harris Ave., Providence, R. I. At normal discharge pressures (2500 psi or less) capacity range is adjustable over more than 10-1 with repeatability of ± 1 percent of rate. Other cited advantages: low initial cost, fewer lubrication points, self align-

KEEP THE JOB OUT OF THE RED

(AND THE RAIN)



WITH UTILITY'S NEW ENCLOSED DRIVE BLOWERS 10″ TO 36″

Every roof installation can be right as rain no matter how much rain on the roof the years may bring. Utility has perfected a full series of high quality enclosed drive blowers, precision-engineered to withstand prolonged wind and weather abuse.

Their long life is further assured by permanently sealed, pre-greased ball bearings which require no further lubrication. They're forever impervious to dirt, dust, moisture and drastic temperature changes — and most important of all, to breakdown caused by lubrication neglect.

These new enclosed drive blowers follow the Utility quality pattern — a pattern that helps you sell the job in the first place, assures your profit in the second. Plan with Utility — and know you'll never see red on any job!

Write for full information on Utility blowers

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UTILITY

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers.

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"A LOT OF PUMP IN A LITTLE SPACE!"

"Buffalo" Close-Coupled Clear Water Pumps

When you want to move as much as 1100 gallons of water per minute in a cramped installation, pick a "Buffalo" Close-Coupled Pump. You'll find it's just what the users call it — "a lot of pump in a little space".

Here's an example. One of our 4" pumps, delivering 600 gpm at a 60-ft. head on only 15 BHP, takes less than 2 cu. ft. of space and is slightly over 2 ft. long.

All other sizes, from 1" to 6" discharges, are proportionately compact and efficient.

Installation, of course, is simple. You have a unit package, with shaft pre-aligned — permanently. The pump can be easily adjusted to the desired discharge angle.

There are many other reasons that make any "Buffalo" Pump you buy *"a lot of pump"*. There's efficiency — durability — and the "Q" Factor* of Quality that only our 78 years of pump engineering can produce.

Write today for Bulletin 975-D for complete details.

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DIVISION OF BUFFALO FORGE COMPANY

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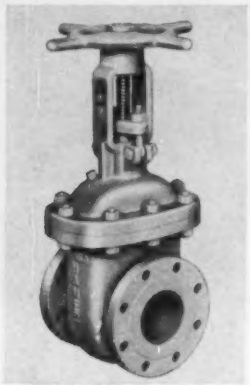
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

EQUIPMENT DEVELOPMENTS

Continued

ing connecting rod, self venting reagent end and check valves, easy and minimum maintenance.



Gate Valve . . .

. . . designed for impenetrable shut-off, upstream and downstream—Hamer Valves, Inc., Box 1851, Long Beach 1, Calif. In addition to metal-to-metal contact of wedge and valve body seats, valve incorporates pair of teflon packing seals said to press dead tight against wedge to form impassable seal. Has stainless steel locking rings, seats for corrosion resistance. Replaceable stainless steel seat lightly welded into valve body.

Storage Water Heater . . .

. . . designed to provide large quantities of water up to 180 F from an installation where headroom is limited —Ruud Mfg. Co., Kalamazoo, Mich. Has 60,000 Btu per hr input on all gases. AGA approved as free standing storage gas water heater and as circulating tank heater. Has hand

Random Thoughts from a Filter Engineer

by George Slater

- **GETTING BACK TO FUNDAMENTALS**
- **PRACTICAL APPROACH TO PERFECTION**
- **LIFE CAN BE DIFFICULT**

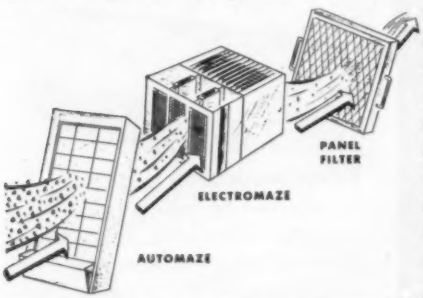
GETTING BACK TO FUNDAMENTALS

Sometimes the search for a service-free filter can be carried too far. Of course, it's important to cut maintenance. But this must not be accomplished at the expense of the primary function of every filter: *to catch dirt and dust.* The perfect filter would remove every speck of dirt and dust and require absolutely no maintenance. Such a filter is improbable if not impossible. Instead, filters will continue to be a compromise between efficiency and maintenance, between how much dirt the filter will catch and how often that dirt will have to be removed.

At Air-Maze, we strive to make a filter that catches the most dirt with the least maintenance. But we never sacrifice a good filtering job just to cut down on maintenance. We've tried not to lose sight of the fact that the chief purpose of any filter is to catch dirt.

PRACTICAL APPROACH TO PERFECTION

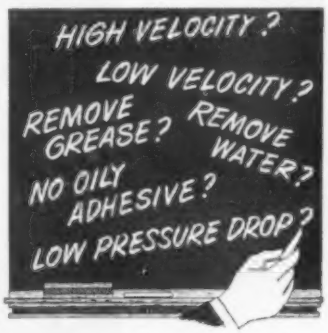
What filter has a high efficiency over a wide range of particle sizes, practically eliminates maintenance, and offers low pressure drop? No filter we can think of. But we do know of a combination of filters that will do just that. For instance, if our Automaze, Electromaze and a stationary panel filter were rigged up in a series, you would have a close approach to perfect filtration. The Automaze stops practically 100% of the larger particles. The Electromaze is extremely efficient in stopping very fine particles, even smoke and atomized oil. And the panel filter offers a third line of defense, particularly against the occasional agglomerate which might be released. Optimum efficiency would be achieved over a wide range of particle sizes. Costly maintenance would be largely eliminated since the Automaze is self-cleaning, the Electromaze can be equipped with an automatic cleaning system and so little dirt would reach the panel filter that it would have to be cleaned only once a year or less. And this combination would have low static pressure loss—less than a half inch of water.



A system of filters like this is the practical approach to perfection.

LIFE CAN BE DIFFICULT

The life of a filter is not an easy one. Filters must work under all kinds of difficult conditions. Some filters must resist a corrosive atmosphere or salt water spray. Others have to work at extremely high or low velocities. Still others have to remove water droplets or grease. Perhaps an oily adhesive cannot be tolerated. Some filters must meet very definite pressure drop requirements. And many filters require a combination of these qualities to do their job well.



Whatever your particular filter problems may be, Air-Maze can make a filter to handle them. Why not write for our product catalog. If you don't see what you want, write and ask. Where sizable quantities are involved, we'll be glad to engineer a filter for you. We have 30 years experience engineering filters that solve special problems. The Air-Maze Corporation, 25000 Miles Ave., Cleveland 28, Ohio.

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for your Big Job of Heating and Ventilating

- Capacities from 83,000 to 1,735,000 Btu per hour
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- 12 basic sizes—one-, two-, and three-fan models
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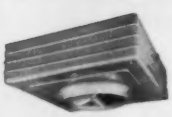
THE NAME TO GO BUY IN UNIT HEATERS

Nesbitt
INDUSTRIAL UNIT HEATERS

PROPELLER FAN UNIT HEATERS


LITTLE GIANT UNIT HEATERS

SERIES C UNIT HEATERS

GAS FIRED UNIT HEATERS

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. Offices in principal cities

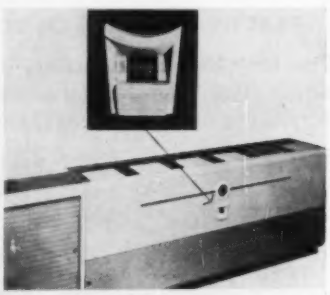
EQUIPMENT DEVELOPMENTS

Continued

hole cleanout for removal of precipitated mineral deposits, ASME rated relief valve, 50 gph recovery rating.

Impeller Pumps . . .

. . . in sizes 3/8 to 1¼ in. IPS with flow ranges to 55 gpm—American Machine Products, Inc., 172 Centre St., New York 13. For use where low pressure pump required to transfer any liquid that does not affect bronze or neoprene, with pressure range to 30 psi, depending upon model. Operate in either direction at high or low speeds. Self priming at about 15 to 20 ft when wet. Should operate at lowest speed commensurate with good delivery. Speeds range 100 to 1750 rpm.



Filter Indicator . . .

. . . designed to indicate when unit ventilator filters need replacement—Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Louisville 8. When filter accumulates maximum dust load, indicator causes words "change filter" to appear on front of unit ventilator cabinet. Operates on principle of constantly measuring resistance to air flow through filter. To be available as factory mounted accessory on company's unit ventilators.

Brundage . . . blowers since 1919

Customers say it so much better

"For the past six years I have been dealing with various manufacturers and suppliers and I can truthfully say that I have never had such co-operation and genuine desire to give the very best of service as I have enjoyed from your company personnel."

— — —

After 36 years in the blower business, we are expected to provide the best in air handling equipment. But, it's service to every customer, large or small, that keeps us growing.

That's why we appreciate hearing things like this from our customers. It lets us know that Brundage service is up to the standards we strive for.

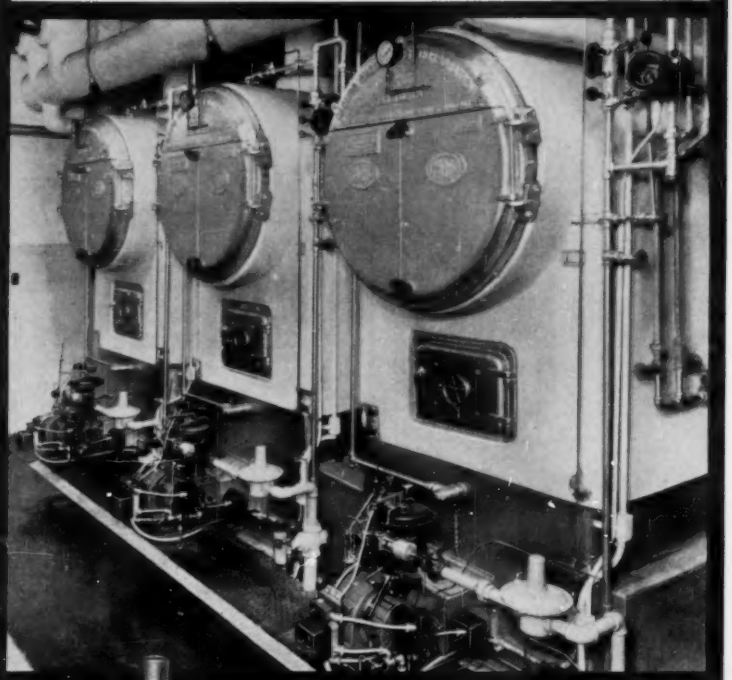
We'd like an opportunity to serve you in the same way.

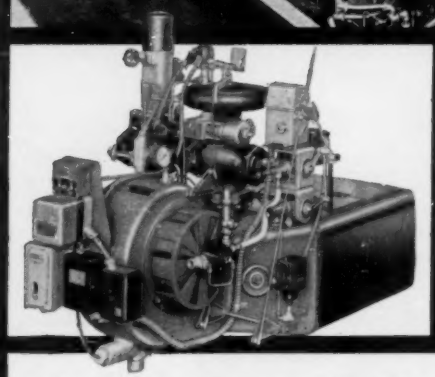
THE Brundage COMPANY

512 N. PARK ST. KALAMAZOO, MICH.

PHONE 2-0251

Reports 33% fuel saving from Mettler "FAN-AIR" burners





Why consulting engineers specify Mettler Burners

Change fuels easily, with remote, manual, or automatic control . . . lifetime integrated multi-port combustion tile provides complete, efficient fuel burning . . . exchange of gas orifices gives wide capacity range . . . exclusive pilot rectification control system assures safer combustion . . . give flexible operation with mechanical or natural draft.

Conversion of three boilers using "FAN-AIR" Dual Fuel Burners produced a sizeable three-way saving! In addition to 33% reduction in gas consumption, boiler maintenance has been reduced greatly because complete combustion keeps the fire-tubes clean. The boiler room is cleaner, too, and firebrick spalling and cracking has been eliminated. Modulating fuel control minimizes temperature fluctuations and adds years of life to the furnaces. These are results you can expect from "FAN-AIR" Dual Fuel Burners . . . results that win customers and influence sales *for you.* Range of sizes from 25 to 500 horsepower, for any grade of gas or oil fuel. Write for specifications and descriptive Bulletin No. 12-S.

THE METTLER CO., INC.

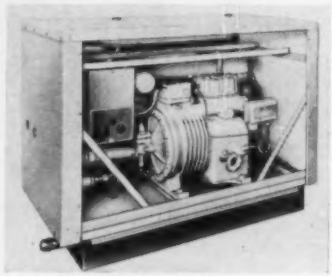
Division of ECLIPSE FUEL ENGINEERING CO.

4366 Worth Street, Los Angeles 63, Cal.

Eclipse

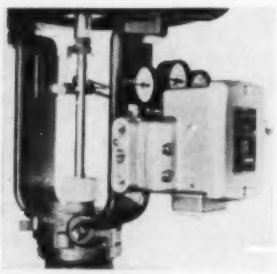
EQUIPMENT DEVELOPMENTS

Continued



Packaged Chiller . . .

. . . for air conditioning, industrial applications—American Coils Co., 360-64 Thomas St., Newark 5. Designed for easy installation, servicing. In sizes ranging 3 to 15 hp. Panels making up four sides and top removable. Cited features: head of condenser detachable to permit cleaning of tubes; completely wired, ready for connection to electrical connection; cabinet insulated with special glass fiber that is sound deadening; full capacity at designated ratings.



Valve Positioner . . .

. . . designed to use motion balance principle—Foxboro Co., Foxboro, Mass. "Type C Vernier Valvactor" is said to overcome friction, reduce line effects to speed valve response to controller signal. Recommended applications are large volume diaphragm motors, processes where controller-to-valve distances are long.

Pipe Tenoning Tool . . .

. . . designed to save engineering time by eliminating need for figuring, specifying short lengths—Spring Load Mfg. Co., 3610 First Ave., S., Seattle 4. In two sizes, 4 to 8 in. and 10 to 20 in. Machines asbestos-cement pipe ends for various assem-

Name your heating job...
Chances are there's a smartly-styled Modine Cabinet Unit to do it better...at less cost

For new construction or remodeling, Modine Cabinet Units give you quick, positive and quiet distribution of heated air. With modest-priced accessories, they also provide introduction, filtering and distribution of outside air. Yes, here's the most practical way to heat or ventilate large public rooms or entryways. Some units heat with hot water, cool with chilled water. Others for steam or hot water heating only.

Choose from five models—120 to 640 Edr. Get all the facts and you'll never install unsightly radiators again. See the Modine representative listed in your classified phone book or write for Bulletin 552—Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wisconsin.

ABOUT THE PHOTOS **1.** Type BT unit with plenum base installed in school entryway. Duct work concealed in wall discharges heated air through wall grill. **2.** Type BF unit with plenum base recessed in masonry wall of supermarket. **3.** Type BT unit, ceiling-mounted in lumber company office and display room. **4.** Type BF unit with plenum base installed in church.

Modine
CABINET UNITS

C-1261

UNITED

CORK PIPE COVERING

LARGER STOCKS . . . FASTER DELIVERY . . . PERSONAL SERVICE

Light Duty Thickness (Ice Water)	to 30° F
Medium Duty Thickness (Brine and Ammonia)	to 0° F
Heavy Duty Thickness (Heavy Brine)	to —25° F or lower

For all standard pipe sizes and fittings. Molded of compressed pure granulated cork, finished with moisture-proof mineral mastic.

United Cork Companies have expanded their facilities to include the production of cork pipe covering. Increased quantities of most frequently used sizes are now available at key points coast to coast . . . in either distributor or branch warehouse stocks . . . thus insuring fast delivery of your installation requirements.

CORK. . . STILL UNSURPASSED AS A COLD LINE INSULATOR

- Extremely low thermal conductivity
- Saves at least 80% of refrigeration lost from bare piping
- Easily economically applied
- Permanent and durable, lowest long-term cost
- Does not support combustion
- Neat, sanitary, vermin-proof
- Has no capillarity

YOUR INQUIRY will bring you specifications, helpful installation data, descriptive material on United's cork pipe covering . . . and patented BB (block-baked) 100% Corkboard specially processed for low temperature work. No obligation.

UNITED BB CORKBOARD

SEE OUR CATALOG IN SWEET'S

UNITED CORK COMPANIES

1 CENTRAL AVE., KEARNY, NEW JERSEY

Manufacturers of cork insulation for almost a half century

Engineering offices, or approved distributors, in key cities — coast to coast.

EQUIPMENT DEVELOPMENTS

Continued

blies. Changing cam plate adapts tool for cutting any type profile, says company. Features automatic feed, quick release.

Indicator-Controller . . .

. . . with pressure range as low as 0 to 0.2 in. of water—Johnson Service Co., Milwaukee 1. Made possible due to free floating slack diaphragm construction designed for greater accuracy at extremely low pressures. Recommended by company for controlling damper, other devices for maintaining static or differential pressures. Can be used for pressures above or below atmospheric, or for maintaining constant differential between two pressures, says company.

Flowmeters . . .

. . . of direct flow design—Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8. Direct flow design is said to keep housing clean. Flexing of vane in operation prevents accumulation of scale or sludge. Basic design improvement, says company, is flexible vane riveted to body at one end, leaving other end free to traverse an arc equal in length to calibrated scale. Horseshoe section of flexible vane permits necessary motion under flow, safely within elastic limits of vane.

NO Reducing Valve Needed

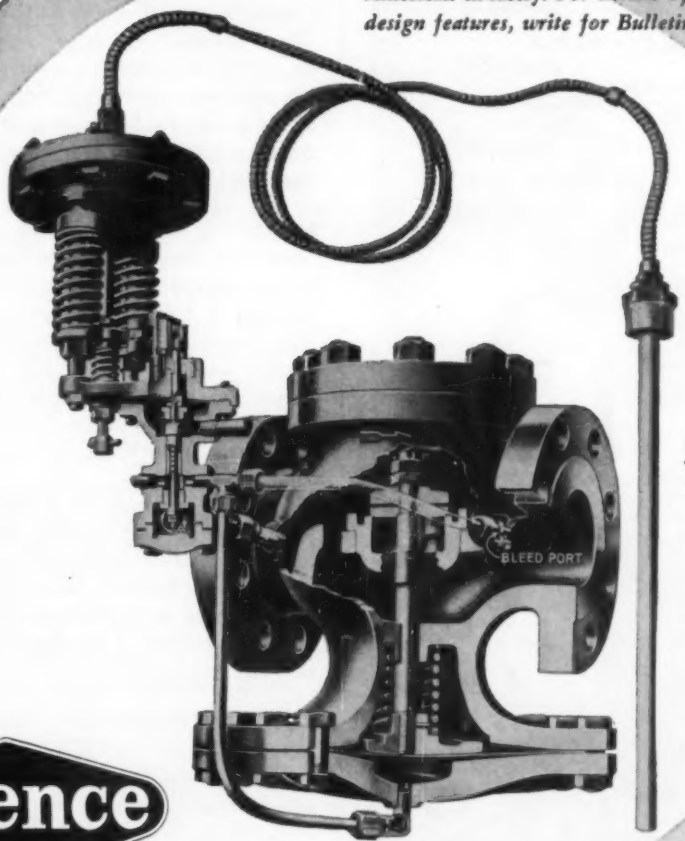
Here's real economy in temperature control.

Because Spence Temperature Regulators are designed to limit heater steam pressures to an adjustable maximum, the need for a separate reducing valve is completely eliminated.

The Spence Regulator takes steam directly from the boiler or high pressure line, reduces the pressure and regulates the flow as required to maintain a constant temperature output from the heater.

This means one relatively small combination pressure and temperature regulator replaces a reducing valve of the same size and a larger temperature regulator. Practically the entire cost of the large separate temperature regulator is saved. And, the total saving would also include the cost of a 3-valve by-pass along with all labor for installation.

This design feature is just one of the reasons for the thousands of Spence installations throughout American industry. *For details of other important design features, write for Bulletin T50.*



SPENCE
TYPE ET150
Temperature
Regulator

Spence

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

SE-131

PIPE HANGERS

FOR

HEATING – PLUMBING
POWER & PROCESS

- SINGLE ROD SUSPENSION
- VERTICAL ADJUSTMENT
- UNRESTRICTED HORIZONTAL MOVEMENT
- MINIMUM HEAT LOSS THRU HANGER

FIG. 140 ROLL HANGER WITH PIPE COVERING PROTECTION SADDLE

Our catalogue illustrates a complete line of Pipe Hangers & Supports and is an indispensable reference book for engineers, contractors, estimators & erecters. Write for your copy now.

MAINTAINING OFFICES AND WAREHOUSES ACROSS THE NATION

CARPENTER and PATERSON, Inc.

18 HURLEY ST., CAMBRIDGE, MASS.

RECENT TRADE LITERATURE...

▸ *ACTUATOR*—Catalog 22 describes new electro-hydraulic acutator designed for precise positional control at high response speeds for valves, slides, gates, other mechanisms. Weighing & Control Components, Inc., 64 Fulmor Ave., Hatboro, Pa.

▸ *ADAPTER UNIONS, FITTINGS*—Catalog No. 200 presents broad line of adapter unions, pipe fittings, boss and bulkhead adapter unions. Includes dimensional diagrams, engineering aids. Anchor Coupling Co., Inc., 342 N. Fourth St., Libertyville, Ill.

▸ *AIR CONDITIONING*—Air conditioning's contribution to greater profits, year 'round high quality for garment manufacturers described in new folder. Cites case histories on how efficiency of employees improved. Carrier Corp., Syracuse 1.

▸ *AIR CONDITIONING, REFRIGERATION, HEATING*—New 8 page bulletin illustrates and describes company's central station air conditioning, conduit "Weathermaster" system, self contained air conditioners, refrigerating machines, compressors and condensing units, evaporative condensers, cold diffusers, steam or hot water unit heaters, gas fired unit heaters, heat diffusers, heating and ventilating units. Carrier Corp., Syracuse 1.

▸ *ALLOYS, FLUXES*—Folder answers users' questions about company's alloys, fluxes for work on steel in maintenance, production, construction. Literature designed to aid operator by: selecting quickly right alloy, companion flux for job at hand; refreshing his memory as to how to apply; finding ways to save money with alloys of which more than needed may be on hand. All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N.Y.

▸ *BOILERS*—Importance of selecting right boiler for steam needs in dairy industry presented in new literature. Chart shows pounds of steam required to forewarm and condense raw materials necessary to make 1 lb of various dairy products. Kewanee Boiler Div., American-Radiator & Standard Sanitary Corp., Kewanee, Ill.

▸ *BOILER COILS*—Bulletin No. HDI-55 covers submerged coils for steel boilers. Illustrated with photographs, coil diagrams. Presents coil rating and comparison chart. Alstrom Corp., 790 E. 176th St., New York 60.

▸ *CONTROLS*—New 92 page catalog for 1956 illustrates, describes, lists specifications for company's line of controls. Is supplemented by dealer price index which lists complete line. Minneapolis-Honeywell Regulator Co., Minneapolis 8, Minn.

RECENT TRADE LITERATURE *Continued*

▶ *COOLING TOWERS*—Literature from manufacturer gives dimensional, capacity, performance data; general specifications for direct driven and belt driven cooling towers for air conditioning, industrial applications. United States Cooling Tower Co., 414 W. Main St., Louisville 2.

▶ *"DEPARTMENTAL" HEATING*—Company's "departmental" heating plan for factories described in new bulletin LL-2268. Details of system, designed to eliminate ductwork, piping, radiation, diffusers, other components of large central heating systems, described and illustrated. Plan utilizes heat machines which can be located where desired. R. D. Fageol Co., Heat Machine Div., Kent, Ohio.

▶ *DUCTILE IRON*—Revised booklet has 28 pages, with tables, charts, photographs, on ductile iron, "the cast iron that can be bent." Illustrations show applications of castings. Includes listing of typical applications in various fields. International Nickel Co., Inc., 67 Wall St., New York 5.

▶ *FANS*—New 4 page bulletin No. 6414 describes "Model G Ventura" fans for business, commercial exhaust applications. Lists performance data on capacities at various static pressures, fan speed, motor horsepower, quietness rating for each of 25 direct driven units in line. American Blower Corp., Detroit 32.

▶ *FLEXIBLE BALL JOINTS*—New 20 page catalog on flexible ball joints details use in many industrial applications. Includes engineering specifications and size, dimension, pressure-temperature data. Barco Mfg. Co., 501 N. Hough St., Barrington, Ill.

▶ *FLUID COOLERS*—New 8 page bulletin S-395 describes dry type fluid coolers developed especially for economical liquid or gas cooling. Contains information on construction, performance, maintenance, plus data on each of their component parts. Trane Co., La Crosse, Wis.

▶ *FREQUENCY RECORDER*—Bulletin B15-18 presents basic description of new frequency recorder's application, operation. Includes mathematical analysis of circuit. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44.

▶ *GLASS FIBER SHEETS*—Chemical resistance, temperature effects, physical properties of polyester resin bonded glass fiber for fabrication of fume exhaust systems, tanks, hoods, stacks, etc. detailed on fact sheet. Corite Products, Inc., 4224 S. Lowe Ave., Chicago 9.

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IN HEATER EFFICIENCY
WITH AN OLSON
• Reverse Current Gas Travel
• Extra Heat Transfer Surface
• Completely Automatic
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WRITE FOR FREE BOOKLET
Olson Heaters are available for Industrial and commercial buildings as well as a number of special adaptions. Capacities are from 300,000 to 2,000,000 BTU output.
STAINLESS STEEL combustion chamber. Floating design eliminates expansion and contraction stresses. Secondary heat transfer is provided with a multiple battery of 10 gauge boiler tubes. The extended flue gas travel and extensive heat transfer surface insures safe metal surfaces and long heater life.
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STAINLESS STEEL DIRECT FIRED HEATERS
ARTHUR A. OLSON & COMPANY • Canfield, Ohio
REPRESENTATIVES IN PRINCIPAL CITIES

RECENT TRADE LITERATURE *Continued*

▸ *HEAT MACHINES*—Specifications, application data for company's heat machines in models "PW-189" and "VO-168" presented in 6 page bulletin LL-2220. Both models are self contained, oil burning units that can be plugged into any electrical connection. R. D. Fageol Co., Kent, Ohio.

▸ *HOSE ASSEMBLIES*—Catalog No. 100 presents wide range of factory assembled high, medium, low pressure hose assemblies for hydraulic, suction return and general applications. Contains flow charts, nomographic chart, thread information, methods for computing length of hose assemblies, etc. Anchor Coupling Co., Inc., 342 N. Fourth St., Libertyville, Ill.

▸ HOSE COUPLING—Revised 20 page catalog on "Quick-Seal" line of quick-connect, quick-disconnect hose couplings features cutaway drawings revealing design, construction. Also describes single-, double-check valve modifications of coupling designed to seal off one or both ends of a fluid line the instant coupling is disconnected. Industrial Sales, Titeflex, Inc., 10 Hendee St., Springfield 4, Mass.

▸ *HOT WATER HEATING*—New 28 page application manual No. 2685 contains discussion of high temperature high pressure hot water heating systems including design, installation, maintenance data. Drawings, charts, graphs, tables amplify text. C. A. Dunham Co., 400 W. Madison St., Chicago 6.

▸ *INSTRUMENTATION*—Automatic control and instrumentation components; water conditioning and steam testing equipment, chemical feeding devices; chemicals for food processing, paper processing, metal protection are some subjects discussed in new 28 page bulletin GSP-901. Company's products and services summarized. Hagan Corp., 323 Fourth Ave., Pittsburgh 30.

▸ *INSTRUMENTS, GAGES*—Technical information, charted data, diagrams on purpose, use of specialized instruments, gages comprise new catalog. Publication covers efficient measurement of combustion, draft, pressure, flow, vacuum, CO_2, smoke, velocity, etc. Is sectionalized by type of instrument. F. W. Dwyer Mfg. Co., P.O. Box 373, Michigan City, Ind.

▸ *LUBRICANTS*—Chemical structure, specifications, properties, applications, general description of new group of fluorocarbon oils, waxes, greases for industrial use described in 16 page booklet. Also discusses color and clarity, viscosity, specific gravity, surface tension, flammability, vapor pressure, dielectric properties, etc. Chemical Mfg. Div., M. W. Kellogg Co., P.O. Box 469, Jersey City 3.

MECHANICAL ENGINEERS

What Should an ME Know About Atomics?

Quite a bit these days, with so many companies getting into the field. While many new firms are now starting to explore the field, Electric Boat Division of General Dynamics Corporation led the way with the building of the first nuclear powered submarines, Nautilus and Sea Wolf.

In addition to increasing its engineering force for work on new and greatly advanced nuclear submarines, Electric Boat is expanding Research and Development operations to include the development of additional practical uses for nuclear energy.

Right now Electric Boat has interesting positions for Mechanical Engineers with experience in vibration and shock, machine design, stress analysis, hydraulics, rotating machinery, power plants or air-conditioning and piping.

Study for bachelor's or advanced degrees is encouraged at Electric Boat, with courses in mathematics, naval architecture, nuclear engineering and nuclear submarine systems offered within the plant, and tuition paid by the company for study in these or other fields at leading colleges and universities.

Men interested in these openings should write complete details of background and experience including initial salary requirements. Interviews will be arranged promptly for qualified applicants. Address Mr. Peter Carpenter.

Electric Boat Division
GENERAL DYNAMICS CORPORATION
GROTON **CONNECTICUT**
near New London on the Connecticut shore

RECENT TRADE LITERATURE *Continued*

▸ *METERS*—New 8 page bulletin describes company's line of all bronze "Rotocycle" meters. Models covered include 2, 3, 4 in. bulk type; 2, 3 in. tank truck type. Flow rates range 20 to 500 gpm. Bulletin also covers accessories. Meter and Valve Div., Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8.

▸ *PIPE TOOLS*—Revised catalog presents recent changes in company's line of pipe tools including threaders, high speed portable pipe machine, power grip chuck, diehead, power drive, geared pipe cutters, etc. Beaver Pipe Tools, Inc., Warren, Ohio.

▸ *PLASTIC PUMPS*—Illustrations, diagrams of standard and "XB" models of company's "Flex-i-liner" plastic pumps contained in catalog No. 55. Includes operating, performance data, along with materials of construction, recommended application tables. Also covers dimensional data, photographs of typical pump motor sets. Vanton Pump & Equipment Corp., 201 Sweetland Ave., Hillside, N.J.

▸ *PUMPS, AIR BRAKE EQUIPMENT, MOTORS*—New 16 page brochure No. 1102 illustrates, describes products in company's line of vacuum and liquid pumps, air brake equipment, hydraulic motors, controls and pumps. Illustrated with installation photographs from wide range of industries. New York Air Brake Co., 230 Park Ave., New York.

▸ *RADIANT BASEBOARD*—New 12 page revised booklet covers company's No. 9 "Base-Ray," I=B=R rated at 3.45 sq ft, No. 7 "Base-Ray," rated at 2.35 sq ft. Two page section presents tables giving I=B=R ratings in Btu per hr at various water temperatures. Burnham Corp., Irvington, N.Y.

▸ *SELECTING AN ENGINEERING FIRM*—Booklet, *A Guide for Selecting an Engineering Firm*, is designed to aid those responsible for their company's entering new product fields, for plant automation, modernization, expansion, and for those who need outside engineering help. Differentiates between engineering installation firm, project engineering firm, engineering design firm. Sketches criteria for determining whether present engineering staff is adequate. The Teller Co., Butler, Pa.

▸ *SERVICE REGULATORS*—Revised 20 page bulletin No. 1026 on service regulators includes illustrated descriptions. Rate-of-flow charts illustrate mathematically the determination of maximum outlet pressure build-up, amount of gas released to atmosphere in case of regulator failure. Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8.

New! Really Compact!

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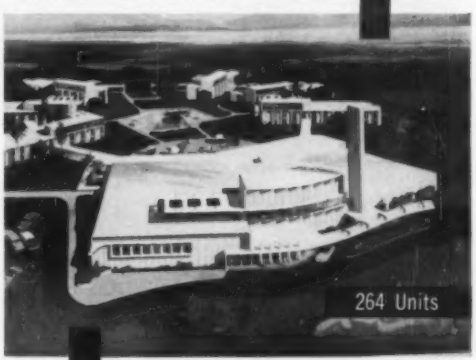
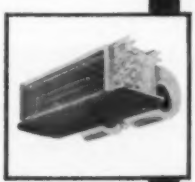
SPOTAIRE-LRC
Air Conditioning



. . . already set for new Lucy Luck Hotel, Las Vegas
* rendering courtesy Architect Homer Rissman


LRC Basic Unit

LRC Concealed Cabinet

No individual-room equipment for complete air conditioning of multi-room structures allows such design freedom for the architect . . . achieves such "pin-drop" quietness of operation!

Eye-opening . . . new D-H Spotaire LRC's require just 11½" head-room from ceiling; provide your best answer for low-cost, individual room air conditioning. 3-speed controls. For cooling, heating, dehumidifying, filtering. Old or new construction.

There's also a full LRC story — installation — operation — no-maintenance — you should know about . . .

Request catalog L.P. 5.220

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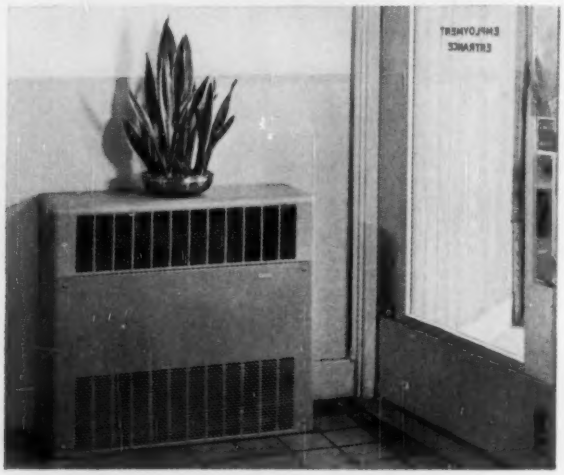
3301 Medford Street • Los Angeles 63, California
(Subsidiary of National - U.S. Radiator Corporation)

Carrier knows heating

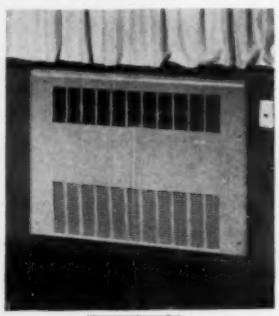
Over fifty years of leadership in air conditioning have given Carrier unmatched experience in the control of temperature—heating as well as cooling. Yes, Carrier knows heating by experience . . . and all this engineering skill and leadership contributes to the superiority of Carrier Unit Heaters.



CARRIER CABINET UNIT HEATERS

Cold reception rooms, lobbies, vestibules, entrances are poor invitations to patrons of banks, hotels, stores, restaurants or similar commercial establishments. Owners will never know how much business they lose as a result. But the cost of a Carrier Cabinet Unit Heater is so little in comparison that the installation becomes a matter of good business.

Carrier floor, ceiling and semi-recessed wall models are suitable for both steam and hot water. Every unit has many unmatched features such as quiet blower assembly, directional air louvers, long-lasting non-ferrous tubes and fins, functional design for easy installation, and attractive styling and finish.



Recessed model

WRITE OR MAIL COUPON for model sizes, feature story and selection data

Carrier

air conditioning
refrigeration
industrial heating

CARRIER CORPORATION
305 S. Geddes St., Syracuse, New York
Send folder on Carrier Cabinet Unit Heaters.

Name_____

Business_____

Address_____

RECENT TRADE LITERATURE *Continued*

▸ *SMOKE, FUME CONTROL—Electric Furnace Fume Control News* is new publication devoted to control of dust and fumes produced by electric steel melting furnaces. Includes general discussion on use of local exhaust ventilation and cloth filter collectors for electric furnaces. Photographs of actual installations show effects. Wheelabrator Corp., 1321 S. Byrkit St., Mishawaka, Ind.

▸ *SOLENOID VALVES*—New 80 page catalog contains illustrations, descriptions, specification charts for company's line of packless and packed construction solenoid valves. Includes flow charts for handling water, air, gases, steam. Automatic Switch Co., 391 Lakeside Ave., Orange, N.J.

▸ *STOKER HEATING—The Logic of Stoker Heating* is 12 page brochure discussing logical reasons for considering stoker fed coal heat for schools, institutions, public buildings. Data includes study of 18 schools. Will-Burt Co., Orrville, Ohio.

▸ *TANK GAGE STICK*—Leaflet list features, stock sizes, special lengths available for newly designed aluminum tank gage stick. B & K Tank Gauge Corp., 44 Lehigh Ave., Paterson 3, N.J.

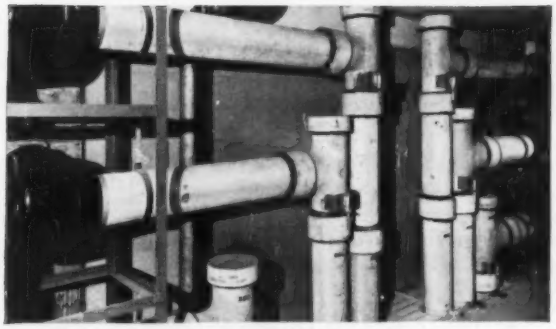
▸ *TITANIUM ALLOYS—Facts About Titanium* contains list of commonly available titanium alloys, their compositions, forming and welding methods, heat treatment and machining information. Compares physical properties with those of a stainless steel and aluminum alloy. Arthur D. Little, Inc., 30 Memorial Dr., Cambridge 42, Mass.

▸ *VALVES, CONTROLS*—Seven sections illustrating valves, controls for nuclear, chemical industries contained in catalog A-115. Over 100 different products covered. Capacity charts, tables of engineering data included. Associated Valve & Engineering Co., 1150 W. Marquette Rd., Chicago 21.

▸ *VIBRATION CONTROL*—How to write vibration isolation specifications for air conditioning, related equipment is subject of bulletin F2A. Contains definitive treatment of factors involved in selection of various isolation media commercially available. Korfund Co., Inc., 48-15 32nd Pl., Long Island City 1, N.Y.

▸ *WELDING*—Twelve page reprint deals with methods of supplying and flow characteristics of carbon dioxide, chemical activity of carbon dioxide, properties of weld metal, operating characteristics and specific applications. Air Reduction Sales Co., 60 E. 42nd St., New York 17.

Indoors...



or outdoors...

TRANSITE INDUSTRIAL VENT PIPE

gives long, trouble-free service

If you need a vent with high corrosion resistance for indoor service, or one that will withstand the deteriorating effect of severe weather conditions, you can rely on Transite® Industrial Vent Pipe to do the job.

Made of two of nature's most indestructible minerals, asbestos and cement, Transite is highly resistant to the corrosive fumes, vapors and dusts that must so frequently be removed from research laboratories and industrial buildings.

Transite has a long record for standing up in all types of weather. It never needs painting or other preservative coatings. It will provide long, trouble-free service without maintenance.

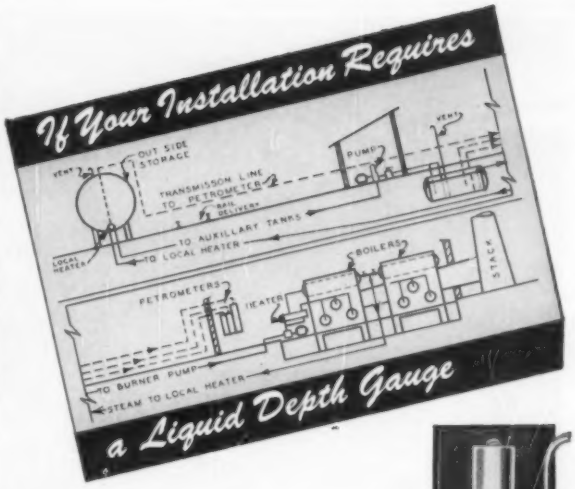
Transite Industrial Vent Pipe offers other advantages, too. It is easy to install because it is light in weight and can be handled readily. No special equipment is needed for cutting on the job. A wide variety of fittings and pipe sizes make it adaptable to every industrial venting service.

For additional information about the use of Transite Industrial Vent Pipe for your venting problems, write to Johns-Manville, Box 60, New York 16, New York.

Johns-Manville

TRANSITE INDUSTRIAL VENT PIPE

AN ASBESTOS-CEMENT PRODUCT



Specify:

PETROMETER

REMOTE READING TANK GAUGES

THE BEST GAUGE FOR:

Commercial and Industrial Fuel Oil Tanks

Domestic Installations with Buried Tanks

Storage Tanks for other liquids—gasoline, solvents, acids, etc.

Here's Why:

No troublesome moving parts—operates on the sound principle of the U-tube. Simple, dependable and accurate.

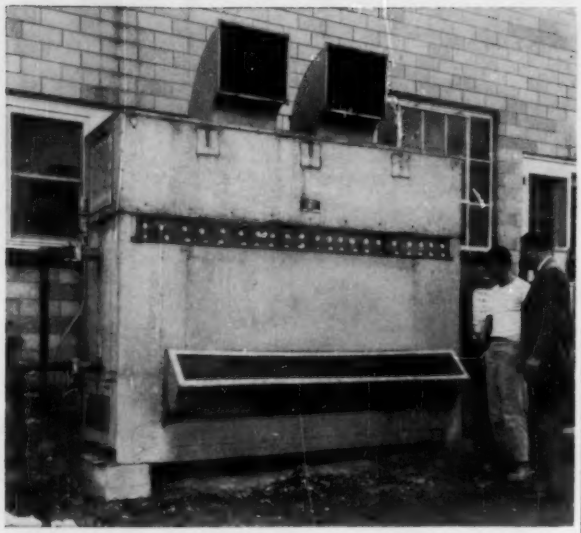
Large, easy-to-read vertical scale gives tank contents at a glance. Eliminates the cumbersome measuring stick and the inconvenience of climbing the tank.

Installation is easy—gauges can be installed on tanks above or below ground level and up to ¼ of a mile away. The tank assembly for the gauge can be installed even when the tank contains liquid. It can also be fitted in the tank separately to complete the tank work. The gauge can be connected any time later. Just tighten one simple connection and the job is finished.

FOR TANKS 20 INCHES TO 50 FEET DEEP. ***Write for Bulletin PV.***

LIQUIDEPTH INDICATORS, INC.

43-22 TENTH ST., LONG ISLAND CITY 1, N. Y.



Operate Your Evaporative Condensers This Better Way

FRICK evaporative condensers with super-saving water-air control attachments automatically cut over-all plant operating costs.

If you want to save water, save power, and save labor; if you must avoid freeze-ups in winter, and bothersome changes in head pressure the year 'round; if your refrigerating plant runs at times without an engineer—then you need the Frick-Mollenberg automatic condenser super-saving control.

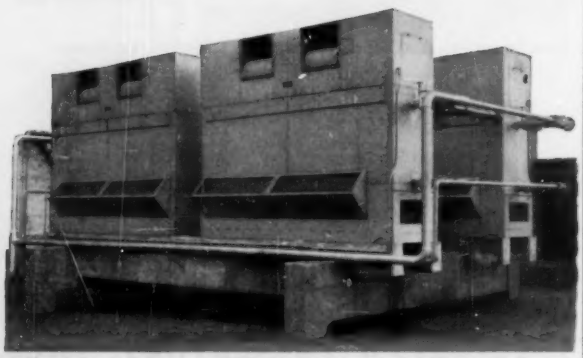
This patented system shuts off the water, and later the fan, when not required. It utilizes water from the compressor jackets. It handles overloads, or pump failure, with fresh water. Water lines are drained in cold weather. Flooding or starving of coolers and coils from fluctuating feed pressures are stopped. These and other advantages are performed automatically, saving the time and labor.

Only Frick Company is licensed to furnish these valuable features. Before buying any evaporative condenser, ask how this super-saving control can reduce operating expense in YOUR plant. The Waynesboro, Penna. Office or a nearby Frick Branch Office will give you detailed information without obligation. Write, wire or phone.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.



These condensers are among many in Buffalo equipped with Frick-Mollenberg super-saving control.

WHO'S WHAT . . .

(New personnel, promotions)

▸ *CARRIER CORP.*—Chairman and President Cloud Wampler, recipient of the annual Industrial Relations Achievement Award. Mr. Wampler has been honored also by reelection to the National Industrial Conference Board for the eighth successive year. Lyle C. Harvey, senior vice president, has been elected a director of the American Gas Assn.

▸ *STERLING ELECTRIC MOTORS, INC.*—Arthur J. Allcock, Jr., chief staff engineer.

▸ *INSTRUMENT SOCIETY OF AMERICA*—Robert T. Sheen, president. A consulting chemical engineer, Mr. Sheen is president of the Milton Roy Co. and chairman of the board of Chemical Pump and Equipment Corp. Other newly elected officers are Richard N. Pond and J. Ward Percy, vice presidents; and Dr. William G. Brombacher, secretary.

▸ *SERVEL, INC.*—Robert K. Eskew, product director for year 'round air conditioning. Mr. Eskew has been with the company for 22 years.

▸ *UTILITIES ENGINEERING INSTITUTE*—R. L. Hendrickson, manager of the refrigeration and air conditioning training department.

▸ *YORK CORP.*—Andrew C. Freimann, vice president in charge of marketing; R.E. Cassatt, manager of commercial sales. This is a correction of an item which appeared on these pages in November.

▸ *EMERSON RADIO & PHONOGRAPH CORP.*—Frank Mitchell, sales manager for air conditioning.

▸ *WORTHINGTON CORP.*—George F. Habach, vice president in charge of engineering. He succeeds Harry A. Feldbush, who will be consultant on special engineering problems.

▸ *NEW YORK AIR BRAKE CO.*—Frederick L. Guyette, chief plant and equipment engineer.

▸ *NATIONAL-U. S. RADIATOR CORP.*—Russell T. Walker, treasurer. Henry M. Gibb, sales manager for the Pacific Steel Boiler Div.

▸ *UNITED STATES STEEL CORP.*—Benjamin F. Fairless, chairman of the corporation's executive advisory committee, selected by the American Institute of Consulting Engineers as the 1955 recipient of its Award of Merit.

FOR FLEXIBLE CONNECTIONS IN

● DUST COLLECTION ● FUME CONTROL
● AIR-CONDITIONING ● MATERIALS HANDLING

PORTOVENT® ◀◀◀ USE ▶▶▶ FLEXAUST®

Spiral wire reinforced
DUCT

Sizes 3" to 36" ID Wide
Pitch type *RETRACTABLE*

Flexaust hoses and Portovent ducts are made with strong cotton or nylon fabrics, impregnated and coated with neoprene compounds. Seams are fully bonded. Other important features are—

- ✔ EXTREME FLEXIBILITY
- ✔ AIRTIGHT — STRONG
- ✔ LIGHTWEIGHT — DURABLE
- ✔ VERY EASY TO HANDLE AND INSTALL

STOCKS IN PRINCIPAL CITIES

Spiral wire reinforced
HOSE

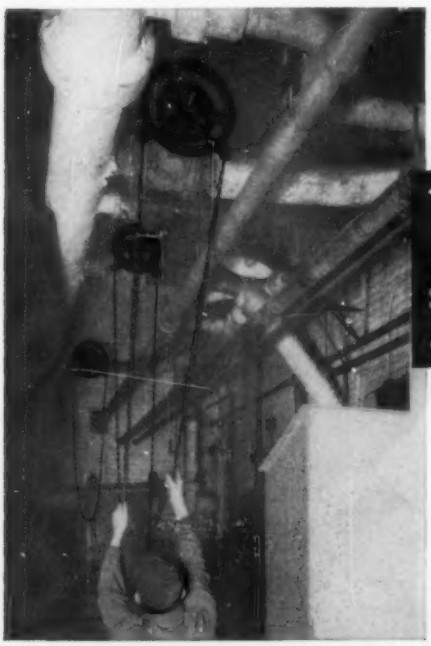
Sizes 1¼" to 36" ID
Close pitch type

WRITE TODAY FOR

Bulletin #40 — General information
Bulletin #41 — Accessories and Installation Data
Bulletin #42 — Technical data on products and service.
Bulletin #43 — Application data and type selector guide.
Bulletin #44 — Friction loss data.
Prices lists.

THE FLEXAUST COMPANY, Dept. HP-12

100 PARK AVENUE NEW YORK 17, NEW YORK



Every Valve Easily Accessible with

Babbitt
—Adjustable—
SPROCKET RIM
with Chain Guide

NEWLY REDESIGNED for greater strength—easier, quicker, more solid assembly.

- **Simplifies pipe layouts**
- **Fits any size valve wheel**
- **Prevents accidents**

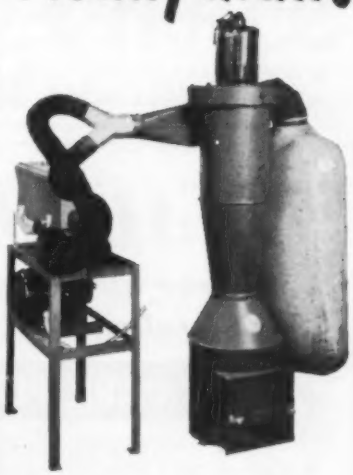
Your supplier carries complete stocks. Call him — or write for details and prices.

Babbitt STEAM SPECIALTY CO.

8 BABBITT SQUARE, NEW BEDFORD, MASSACHUSETTS, U. S. A.

TORIT
DUST COLLECTORS

Really draw!



A size and model to solve any dust collecting problem, Torit collectors provide complete, all-around dust control. Torit collectors are unitized for custom installation on each machine, giving power and suction only when machine is operating. Keeps plant and machines free from clogging and unsightly dust. Furthermore, cleaned and filtered air is exhausted back *into* the room maintaining heat balance. Find out now how Torit unitized dust control is engineered to your problems.

See our catalog in Sweet's Machine Tool File, or write:

TORIT
MANUFACTURING CO.
283 Walnut Street • St. Paul 2, Minn.

WHO'S WHAT

Continued

▶ *TRION, INC.*—Norbert F. Eichelsbacher, vice president in charge of manufacturing. Treasurer of the company since its inception in 1947, Mr. Eichelsbacher has also headed manufacturing for the past two years.

▶ *IRON FIREMAN MFG. CO.*—R. K. Handley, director of manufacturing for all five company plants. Stewart H. Kibbe has been reappointed sales training director, after a tour of military duty.

▶ *RHEEM MFG. CO.*—Lyttleton Price, Jr., manager of the research and development. His assistants are A. D. Lutgens, E. F. Searight and Karl J. Schueppert.

▶ *TRANE CO.*—Arthur M. G. Moody, awarded the 75th anniversary medal of the American Society of Mechanical Engineers. Mr. Moody is the company's senior development engineer.

▶ *ROCKWELL MFG. CO.*—Willard F. Rockwell, Jr., president of the company, has been elected president of the Pennsylvania State Chamber of Commerce.

▶ *BORG-WARNER CORP.*—Joseph M. Gartner, administrative assistant to the president. A. W. Rose, vice president and general manager of the company's Petro-Mechanics Research Div. Mr. Rose is also a vice president of the parent company.

▶ *WESTINGHOUSE ELECTRIC CORP.*—Edward O. Edney, Jr., project manager for the company's nuclear power program.

▶ *AMERICAN AIR FILTER CO., INC.*—Robert F. DeLay, former advertising manager, has been appointed vice president and account supervisor of a Chicago advertising agency.

▶ *FAIRBANKS, MORSE & CO.*—Henry J. Barbour, manager of advertising and public relations. Mr. Barbour has been with the company for 31 years.

▶ *A. M. BYERS CO.*—Paul E. Barley, superintendent of maintenance at the company's Ambridge plant.

▶ *FEDDERS-QUIGAN CORP.*—Edward M. Becker, sales manager of the refrigeration division. He was New York district sales manager.

▶ *PHILADELPHIA GEAR WORKS*—Peter B. Davies, assistant sales manager.

▶ *PYLE-NATIONAL CO.*—George C. Foy, manager of field sales.

In All This World

no finer air-conditioning than International as installed in

THE PARK PLAZA HOTEL, ST. LOUIS

Yes, after personal inspection of similar installations, the Park Plaza chose International with utmost confidence. For only International gives you such powerful, yet whisper-quiet operation, based on proved basic engineering which eliminates ductwork . . . cuts installation costs to a minimum. Each unit individually controlled for complete summer and winter comfort. Write, wire or call for full information now.

CEILING HIDEAWAY MODEL C. H. W. 90

ALL ALUMINUM CONSTRUCTION

MANUFACTURING COMPANY

Air Conditioning Division

the most practical air conditioning ever built!

600 E. GRAND AVENUE OKLAHOMA CITY, OKLAHOMA

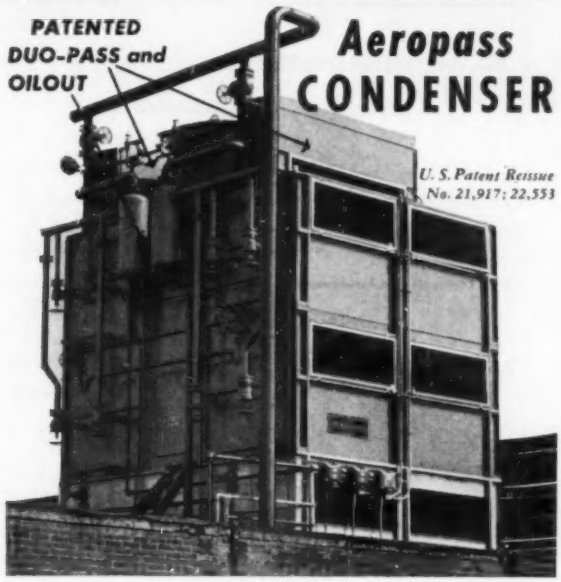
CABLE ADDRESS "INTIME"

400 TONS CAPACITY

PATENTED DUO-PASS and OILOUT

Aeropass CONDENSER

U. S. Patent Reissue No. 21,917; 22,553



YOU USE LESS POWER...
SAVE CONDENSER WATER...
SAVE UPKEEP COST

For large refrigeration systems, NIAGARA gives you a choice between a battery of condensers (that may be cut on or off with the load) or a high capacity condenser that saves space.

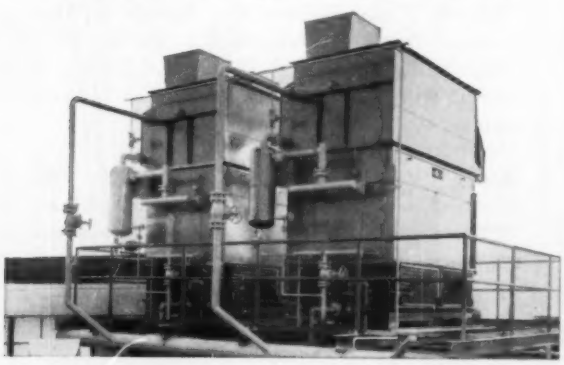
Both have the patented "Duo-Pass" and "Oilout" that remove superheat and keep the system free of oil. Results: you save one-third or more of power cost and upkeep expense. Niagara Patented Balanced Wet Bulb Control gives lowest head pressure operation automatically. *Write for Bulletin 111.*

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

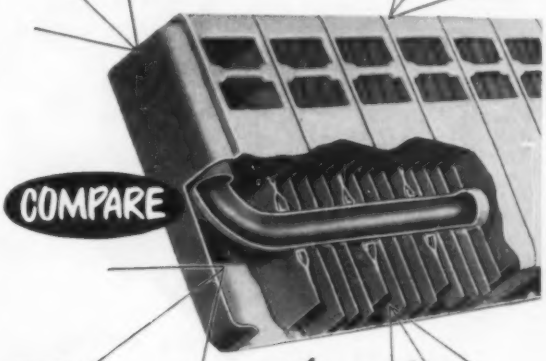
Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Field Engineers in Principal Cities of U. S. and Canada



SHAW

RADIANT CONVECTION RADIATORS



First Choice

FOR HEATING

- rugged construction
- full length steel heating plates
- extra heavy copper tubing
- balanced combination of radiant-convected heat
- 3"—space saving design
- high heating efficiency
- lifetime beauty—no upkeep
- right or lefthand supply tapping
- factory assembled—one piece units
- fast, easy installation

Regardless of heat-source . . . steam or hot water . . . Shaw provides a perfect ratio of radiant-convected heat. Schools, Hospitals, Institutions, Office Buildings, Industry and the Home have long demanded a more compact and efficient radiator combining ruggedness of construction with beauty and efficiency.

There is a Shaw radiator available for every heating application. The Shaw Panel Baseboard with the long, low, thin look for modern baseboard heating. The Shaw Panel Radiator for under windows or areas requiring utmost efficiency and with small available space. The Perkins Industrial Radiator for the factory, warehouse, and where uniform, constant heat is desired and is not obtained with the on and off type blast heating common with unit heaters.

SP-3

SHAW-PERKINS MANUFACTURING CO.

201 EAST CARSON ST., PITTSBURGH 19, PA.

Install

TUTHILL TYPE SU *Pumping Units*
For Dependable Service
in Industrial Heating

Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages for dependable, uninterrupted operation that add up to reduced maintenance expense.

Features like these make the SU outstanding for handling heavy fuel oils in industrial heating:

- ★ **Motors up to 5 h.p. mounted on slotted slide rails for easy adjustment or replacement. No drilling or tapping required.**
- ★ **Cast iron base with mounting bolts and adjustments easily accessible.**
- ★ **One-point belt-tension adjustment.**
- ★ **Jack shaft, supported by ball-bearing pillow blocks, carries entire weight of pulley and absorbs belt tension.**
- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Pump and jack shaft direct-connected by flexible coupling for better alignment and simplified mounting.**
- ★ **Wide range of pump models and capacities.**

Complete data is presented in Tuthill Catalog No. 107. Write for your copy today.

TUTHILL
PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Pumps since 1927
939 East 95th St., Chicago 19, Illinois
Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

WHO'S WHAT

Continued

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *GAINES-COLLINS*—Jack Rich, representative in Texas, Oklahoma, New Mexico, Arkansas, southwest Missouri.

▸ *ROCKFORD BRASS WORKS*—William G. Nelson, Wisconsin sales representative.

▸ *TORK CLOCK CO., INC.*—Russ J. Gerde, north central territory expanded to include the Milwaukee area.

▸ *VANTON PUMP & EQUIPMENT CORP.*—Unit Process Co., sales representative for Idaho, Montana, Washington, Oregon, Alaska; Backus & Spencer, a similar appointment for northern Ohio.

▸ *MODERNHEAT CABLE CORP.*—W. J. Milner & Co., representative covering Arkansas, Alabama, Louisiana, Georgia, Florida, the Carolinas, Mississippi, Virginia.

▸ *ALLEGHENY LUDLUM STEEL CORP.*—William W. Armstead and Neale Carter, appointed to Indianapolis and Birmingham sales offices, respectively.

▸ *FOXBORO CO.*—R. E. Rogers, manager of West Coast sales.

▸ *CLEAVER-BROOKS CO.*—Distributors for oil, gas, combination burners are: Central Burner & Equipment Sales & Service, Marshfield, Wis.; E. A. Cornely, Inc., San Francisco; Graham & Garretson Burner Co., Ottumwa, Ia.; Hev-E-Oil Burner Sales Co., Hingham, Mass.; John Kalmacoff Agency, Victoria, B.C., Canada; Larry & Chuck's Heating Service, Portland, Ore.; Gordon Latham, Ltd., Vancouver; Mathews Sales & Service, Inc., Portland, Me.; T. E. Matthews & Brother, Martinsburg, W. Va.; Muesing-Merrick Coal & Co., Inc., Indianapolis; McCartney-Denver Co., Denver; Harry E. Nason, Auburn, Me.; Reliable Oil Heating Service, Benton Harbor, Mich.; Webber Oil Co., Bangor, Me.; Wiedenhoft Plumbing & Heating, Walworth, Wis.; Wisconsin Ice & Coal Co., Milwaukee; Zenith Sales Co., Eau Claire, Wis.

▸ *OLIN MATHIESON CHEMICAL CORP.*—John J. Forst, sales representative for roll bond products in Detroit; R. E. Bockhorst, a similar appointment in Dayton.

▸ *YORK-SHIPLEY, INC.*—Russ B. Jenner, factory regional manager for New England.

for

SPECIFICATION

and

BUYING INFORMATION

Use your complete, up-to-date

JANUARY DIRECTORY ISSUE

Your job will be a lot easier if you'll keep the January Directory issue of Heating, Piping & Air Conditioning constantly available for handy reference. It's one of your most valuable tools — one which will save you many hours of looking up the products you need for your various jobs. It's the ONE complete, up-to-date, readily accessible source of product information on who makes the boilers, valves, controls, etc., you need — and where they're located. They're identified by trade names, too. EVERY product is listed, alphabetically arranged and printed on a distinctive yellow stock for easy reading and reference.
Keep it handy . . . the time you save with it can be used to advantage in other ways.

. . . here's what other contractors and dealers have to say . . .

"Your Directory issue is an excellent buyers' guide. We use it a great many times during the course of the year."

"We find both Directory and Advertising Section helpful. The advertising gives us the product details we need."

"Your directory stays in this office until the next January issue comes along. Numerous times we refer to it."

"In our work, we make use of your Directory time and time again. Our reference file would not be complete without it."

REMEMBER — EVERY product is right at your fingertips

HEATING, PIPING & AIR CONDITIONING
6 North Michigan Ave. Chicago 2, Ill.

NEW *Ramset*®

DUO-JOBMASTER

gives you

TWO TOOLS IN ONE!

RAMSET's new tool has interchangeable barrels, to set either ¼" or ⅜" fasteners into steel or concrete—an added convenience to the time, temper and money-saving advantages of RAMSET FASTENING SYSTEM.

Will do all of your fastening jobs

Operator carries the second barrel in his pocket like a fountain pen, ready to set any variety of fasteners the job may require—light, medium or heavy duty anchoring into hard materials like concrete or steel.

Makes tough jobs easy

No more drilling or chipping; fasteners are set instantly, accurately and permanently with a press of the trigger.

Learn about this low-cost, time-saving, modern way to fasten. Find for yourself what it can mean to any construction job. A demonstration will convince you.

Ramset Fastening System
WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION
FIRST IN POWDER-ACTUATED FASTENING

12109 BEREA ROAD • CLEVELAND 11, OHIO

WHO'S WHAT

Continued

▸ *ANSUL CHEMICAL CO.*—New sales representatives for the company's refrigeration division and their territories are: Thomas O. Lester, Tennessee, Kentucky, West Virginia, Ohio, Michigan, western Pennsylvania; William H. Miller, New York State, New England; Earn W. McCoy, Texas, New Mexico, Mississippi, Louisiana.

▸ *IRON FIREMAN MFG. CO.*—Field men added to the sales organization are: Stanley F. MacMichael, district sales manager for eastern half of Ohio; William H. Schrum, to cover eastern Pennsylvania excluding Philadelphia; Donald O. Spicer, to handle sales for the Indianapolis wholesale operation; Howard Misfeldt, district sales manager for Nebraska, South Dakota; William D. Burk, to cover Alaska and the Yukon.

▸ *EMERSON RADIO AND PHONOGRAPH CORP.*—J. Carl Brigance, Midwest district manager for the company's air conditioning division.

▸ *WHIRLPOOL-SEEGER CORP.*—Eddy & Co., Providence, R. I. distributor.

▸ *BEAVER PIPE TOOLS, INC.*—William H. Vaught, Sr., district manager of Kentucky, West Virginia, southern Ohio, southern Indiana territory.

▸ *DRAVO CORP.*—Allied Plumbing Supply Co., distributor of heating equipment for Corpus Christi marketing area. Harry F. Haldeman, Inc., Dravo's southern California distributor, has promoted R. E. Gray from sales manager to vice president.

▸ *SUNDSTRAND MACHINE TOOL CO.*—John F. Griffey, district sales manager in the eastern territory for the company's hydraulic division.

▸ *CINCINNATI SUB-ZERO PRODUCTS CO.*—Neil Winikoff, Washington-Oregon sales representative.

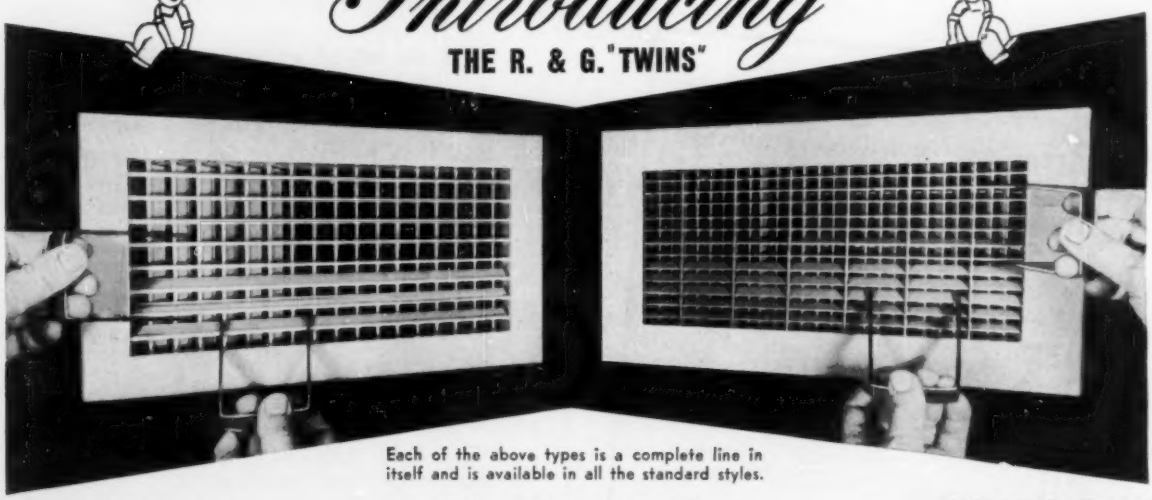
▸ *ROCKWELL MFG. CO.*—Orville Cochrane, manager of new branch office at Denver for the company's valve and meter division.

▸ *GENERAL CONTROLS CO.*—Appointments for Perfex Div.'s sales organization: Hugh Cameron, Cleveland regional manager; James McGuire, regional sales representative in New York. Other sales representatives are: George Hobby, Belleville, N. J.; Richard Gallagher, Boston; George Williams, Detroit; Warren Edwards and Elmer Szabo, Cleveland; Erwin Wiese, Milwaukee; George Schuck, Baltimore; Hugh Hackett, Philadelphia; Irving Parri, Portland, Ore.

▸ *AIRTEMP DIV., CHRYSLER CORP.*—Robert E. Nutting, district manager, attached to the company's Detroit sales office. ⫩

Introducing

THE R. & G. "TWINS"



Each of the above types is a complete line in itself and is available in all the standard styles.

THE BLADE TYPE

Air Conditioning type Registers and Grilles for the maximum in directional and volume control — Noiseless Operation — Strength and Beauty. Registers equipped with tamperproof opposed blade action, key operated shutters.

For QUALITY, STRENGTH, and DEPENDABILITY

in SCHOOLS
in HOSPITALS
in PUBLIC BUILDINGS

Dept. B

FREE Catalog on Request

Two complete lines of Registers and Grilles for HEATING • VENTILATING • AIR CONDITIONING

R G

REGISTER & GRILLE MFG. CO., INC.

70 BERRY STREET, BROOKLYN 11, N. Y.

THE BAR TYPE

Solid 14 gauge adjustable bars make this style rugged and long lasting. Interlocking construction makes them tamperproof, adjustable only with the special tool provided.

We do utilize all the principal vibration control media because we believe each has its place, either alone or in combination in controlling vibration problems. We don't think one product, or even one type of product can solve all vibration problems efficiently and economically.

During our half-century of experience we've come up against *and solved* almost every imaginable type of vibration problem. And, we've corrected enough faulty vibration control installations to know that each problem is unique in itself. There is no panacea. A single product cannot solve *all* problems.

So when you have a problem, bring it to Korfund—the pioneer in the field of engineered vibration control. You'll get impartial recommendations on media, whether it be springs, rubber, or cork, alone or in combination. Our experience will tell us which is best for you. And after all, there is no substitute for experience.

For your free equipment isolation Selector Chart and additional data on increasing production and reducing costs, write for your copy of Bulletin 25, or see our catalog in Sweet's Files.

For specific recommendations, contact us or your local Korfund office. Look under "Korfund" in your local Telephone Directory or in Thomas' Register. A half-century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

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Walker

"BB" Industrial Draft Controls

In the Fairmac Corporation Housing Development near Washington, D.C., replacement of existing "controls" with Walker "BB" Draft Regulators reduced fuel consumption in two boiler houses to such an extent that the cash savings actually paid for complete installation of all 85 Walker draft units! These fuel savings were accomplished in only *three months time*—and they were so spectacular that the April, 1953 issue of *Fueloil & Oilheat* devoted its lead article to a report of the complete details of the story! Reprints of this article are available upon request.

Walker "BB" Industrial Draft Controls can bring you the same kind of savings that the Fairmac Corporation is enjoying. Find out how by reading Walker's "Handbook of Draft Control for Industrial Installations." It gives the most complete facts ever assembled on control selection, proper location, capacities, installation and adjustment. This valuable handbook is absolutely free — and your request for a copy puts you under no obligation. Reserve your copy now—just send coupon below to:

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MANUFACTURING & SALES CO.
1720 Penn St., St. Joseph, Mo.

Gentlemen: I want the complete story on how Walker "BB" Industrial Draft Controls can cut my fuel costs. Please send me your free handbook on "Draft Control for Industrial Installations." I'm considering draft control installations on:

Name.....

Company.....

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State.....

- Office Building ☐
- School ☐
- Apartment ☐
- Theater ☐
- Store ☐
- Factory ☐
- Laundry ☐
- Garage ☐
- Other _____

For combustion testing in the field!

HAYS ORSAT TYPE GAS ANALYZER

The first of its type developed for field work, the Hays Analyzer answers the need for an Orsat type gas analyzer husky enough for use in the boiler room and for installation and service work in commercial and home heating plants, yet simple, fast and accurate!

It's Rugged—Made with strong pressed steel, the Hays Orsat is designed for continuous boiler room operation and field work . . . takes wear and tear in stride!

It's Portable—The Hays Orsat contains everything needed for *complete* analysis (CO_2, O_2, CO) in one light (only 8 lbs.), easy-to-carry case . . . goes wherever it's needed. Compact, with all parts easily accessible.

Available in one, two or three unit styles. Does a complete testing job for CO_2, O_2 and CO in 3 minutes!

Send for publication 54-668-27—a complete description of all styles.

Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Veriflow Meters and Veriflat
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
Electronic Flowmeters
Electronic Feed Water Controls
Miniature Remote Indicators

THE hays CORPORATION

MICHIGAN CITY 14, INDIANA

WE HEAR THAT . . .

▸ Merging of two major Chicago appliance firms into what is said to be the world's largest manufacturer of room and packaged air conditioning equipment was revealed when *CORY CORP.* announced the purchase of all capital stock of *MITCHELL MFG. CO.* Purchase price was not disclosed but assets of the Mitchell company were estimated to be in excess of $3 million. Mitchell will continue to operate as it has in the past, but as a wholly owned subsidiary of Cory, *J. W. ALSDORF*, Cory president, said. He emphasized that it will operate independently and will be competitive with Cory's Fresh'nd Aire Div. No personnel changes are contemplated except that *A. N. PRITZKER*, chairman of the Cory board of directors, will occupy a similar position for the Mitchell subsidiary. Mr. Alsdorf will be president of the two firms. *B. A. MITCHELL* will step down as active head of the company bearing his name but will serve Cory in an advisory capacity.

▸ *TYPHOON AIR CONDITIONING CO.* and *HUPP CORP.* are to merge. According to a joint statement by officials of both companies, the agreement has been approved and the merger will be consummated in about three or four weeks. Typhoon will operate as a division of Hupp, but will continue all its own franchise agreements now in effect.

▸ *AMERICAN RADIATOR & STANDARD SANITARY CORP.'s* wholly owned subsidiary, *KEWANEE-ROSS CORP.*, was dissolved November 1. Two new American-Standard divisions will continue Kewanee-Ross operations. The divisions are the *KEWANEE BOILER DIV.*, which will manufacture Kewanee boilers, and the *ROSS HEAT EXCHANGER DIV.*, which will produce heat exchangers, surface condensers and allied products. *W. B. RUSSELL*, president of Kewanee-Ross Corp., has been named president of the Kewanee Boiler Div. *E. M. PALMER* is executive vice president, *JOHN C. LINSENMEYER* has been named president of the Ross Heat Exchanger Div., with *RICHARD S. READE* as executive vice president. Mr. Linsenmeyer is president of *AMERICAN BLOWER CORP.*, also a division of American-Standard.

▸ Effective December 31 the *LENNOX FURNACE CO.* will change its name to *LENNOX INDUSTRIES, INC.* The company plans to enter the industrial heating and ventilating field. It will make numerous types of fan equipment for industrial ventilating and exhaust problems as well as a line of industrial unit heaters and make-up air units.

▸ At the *AMERICAN WELDING SOCIETY'S* recent meeting in Philadelphia, *JOHN J. CHYLE*, weld-

Quickdraft

CURES NATURAL DRAFT TROUBLES

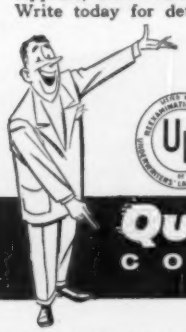
Increasing concentration of carbon and sulphur dioxides in the atmosphere, recently reported by scientists, handicaps ordinary chimneys by decreasing natural draft (CO_2 is 55% and SO_2 is 225% heavier than air) . . . and by demanding more draft because additional air is required to provide sufficient oxygen. In addition, current trends constantly demand more draft . . . (1) new fuels that require more oxygen . . . (2) longer flue travel in furnaces and boilers. As a result, more and more heating plants operate at low efficiency because of gravity draft troubles.

WITH POWER DRAFT THAT ASSURES HEATING PLANT EFFICIENCY

. . . No Fans or Motors in Smoke Line

Quickdraft power draft stops sooting, eliminates chattering, drys wet chimneys and greatly increases combustion efficiency. It does not obstruct smoke line with fans or motors. Quickdraft assures top performance from old and new heating plants. All models are approved by Board of Standards and Appeals, New York City. Write today for details.

Residential models for smoke outlet diameters 6, 7, 8, 9 and 10 inches.



N-285-QD

Quickdraft COMPANY
Canton 1, Ohio

QUICKDRAFT COMPANY
Dueber-Hampden Building
P. O. Box 87-K
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Another EXAMPLE OF A SATISFIED CUSTOMER

of Activated Charcoal AIR PURIFICATION

The Immaculate Conception Mission School, Stephan, S. Dak., uses Activated Charcoal air purification to save on heating costs during winters that range to 35 below.

"Since our school is used 8 hours or more a day, we are very pleased to have this type of ventilation to keep the rooms fresh," reports Father Augustine Edele, O.S.B. "You may use our school as an example of a satisfied customer."

Both first cost and operating cost can be cut 30% by using Barnebey-Cheney Activated Charcoal air purifying filters in the heating-ventilating system.

Get the full story, write for free bulletin "Air Recovery in Churches and Schools."

see the article on Air Recovery, pages 76-79

BARNEBEY-CHENEY COMPANY
Columbus 19, Ohio

BARNEBEY-CHENEY LTD. St. John's, Que.

WE HEAR THAT

Continued

ing research director of the *A. O. SMITH CORP.*, received the Samuel Wyle Miller Medal for contributing to the advancement of welding. Another highlight of the session was the Adams Honor Lecture, presented by *LAMOTTE GROVE* of *AIR REDUCTION SALES CO.*

▸ *MULTI-MATIC CORP.* is changing the company name to the *GEN-A-MATIC CORP.* The name change has been adopted because of the popularity of the "Gen-A-Matic" generators and pumps, and the company is desirous of having all its products associated with that name.

▸ *A. W. CASH CO.* has purchased the business of *FARRIS STACON CORP.* The company will manufacture a new product line, "Cash Standard Stacon," and will remove the Farris Stacon operations from Palisades Park, N. J., to the Cash plant in Decatur, Ill.

▸ A $2 million expansion program has been announced by *AIRTEMP DIV., CHRYSLER CORP.* Part of a five year development plan, the program will include facilities for the manufacture of car air conditioner compressors, low cost furnaces, and waterless air conditioners.

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.* has a new one story office building in Boston. Located at Soldiers Field Rd. and Everett St., the 16,160 sq ft structure will be branch headquarters for the firm's commercial heating and industrial sales and service in Massachusetts, Maine, Rhode Island, New Hampshire, and the northern half of Vermont.

▸ *COMMERCIAL FILTERS CORP.* has acquired the filter divisions of two Indiana companys; namely, *HOUDAILLE-HERSHEY OF INDIANA, INC.*, Lebanon, and *MICHIANA PRODUCTS CORP.*, Michigan City. It is contemplated that the operations of the latter company will be consolidated with those at Lebanon.

▸ Integration of the newly acquired *PERFEX DIV.* into *GENERAL CONTROLS CORP.* was completed recently. *MAURICE EASTIN* is manager of sales for the new division and will be based in Skokie, Ill., the parent company's eastern sales headquarters.

▸ A new jobber sales division has been formed by *HAGAN CORP.* to handle the marketing of Calgon products sold through distributor outlets for air conditioning, laundry and piping supplies. The division combines the present activities of the Micromet and laundry departments. ≠

weil TVC LOW PRESSURE SYSTEM

Send for Bulletin TVC-300 E

Condensate Pumps

featuring
- LOW RETURN CONNECTION
- LOW SPEED — LONG LIFE
- CAST IRON RECEIVER
- LOW WATER LINE

Duplex Unit
25½" Diameter Receiver

Duplex units, with automatic alternators, furnish "extra" insurance, provide overload protection and guarantee an even longer life. Height of return above floor is 7⅜".

Fig. No. 303 B

Single Unit
21" Diameter Receiver

Height of return is only 6⅞" above floor.

Fig. No. 302 A

Single units of any rating can also be furnished in the 25½" diameter receiver. This receiver is furnished machined and drilled for the addition of another pump and control so as to enable conversion to a duplex unit at a later date.

Capacities From
500 to 10,000 sq. ft. E.D.R.
Up to 30 lbs. discharge pressure

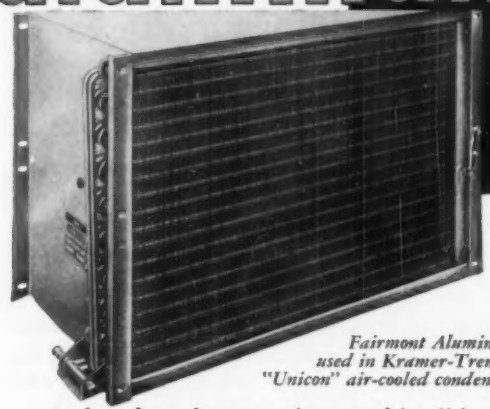
TVC Condensate Pumps are low speed (1750 RPM) for long life, are easily installed (two piping connections) in areas where space is important. The cast iron receiver and sturdy pumping unit (equipped with a dirt strainer), all completely factory assembled and tested, assure a long lived trouble-free installation.

Stocked by all leading jobbers

weil PUMP CO. 1514 N. FREMONT ST. • CHICAGO 22

Better Yet,

USE FAIRMONT aluminum



Fairmont Aluminum used in Kramer-Trenton "Unicon" air-cooled condenser.

In finned condenser surfaces, and in all better parts and accessories for heating and cooling applications, Fairmont 2S, 3S and 52S wrought aluminum sheet is nationally recognized for highest quality and uniformity. Improved appearance, high thermal conductivity, light weight, wear-resistant ductility, and non-corrosive and stainproof surfaces—all these objectives and more are readily achieved.

Fairmont bright aluminum rolling mill products—sheet, coil and circles, are now available for prompt delivery to meet manufacturing schedules.

FALCO

SALES OFFICES:

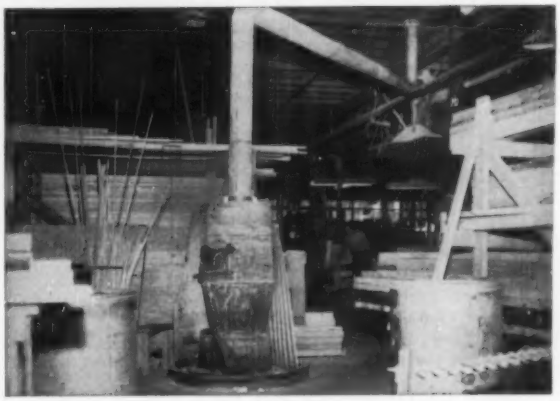
Baltimore, Buffalo, Chicago, Cleveland, Denver, Fairmont, Indianapolis, Los Angeles, New York City, Philadelphia, St. Louis, Schenectady

FAIRMONT ALUMINUM COMPANY

•

Fairmont, West Virginia

DRAVO HEATERS do it again!



BEFORE—Overhead Door Company of Penna., Inc. depended on "stoves" to heat the work area in its Lewistown, Penna. plant. These "stoves" did a poor heating job and required constant attention.

AFTER—Dravo *Parallo* Heaters and a Dravo *Counterflo* Heater do a real comfort heating job . . . help reduce fire insurance premiums 25% . . . increase working space 10% . . . eliminate 24-hour-day, 7-day-week watchman service . . . operate automatically eliminating the need for attendants. This new heating system also provided much better working conditions for employees.

Mail this coupon for complete information on Dravo Heaters.

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

☐ *Counterflo* Space Heater ☐ *Parallo* Space Heater
☐ *Gas Fired* Unit Heater

☐ Please have a representative call at no obligation to me. Ask for Bulletin A-1412.

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Company_____

Address_____

City_____ Zone____ State_____

Use *Stic-Klip*® for

Insulation Installation

ON AIR CONDITIONING AND VENTILATING SYSTEMS
FOR COLD STORAGE PLANTS, BUILDINGS AND SHIPS.

1 TYPE B with Locking Plate
2 TYPE B
3 TYPE A
4 TYPE S ADHESIVE
5 SPRING TUBING CLIP (¼" and ⅜")
6 HOLDING PLATE used with Type A and B
7 TYPE N with Speed Washer
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Stic-Klips permanently bind almost any insulating material to masonry, wood, metal — flat, corrugated, curved, unusual-shaped. This modern method eliminates drilling, puncturing metal — saves time and money.

For illustrated booklet on any of these applications, write Dept. HP

Stic-Klip MANUFACTURING CO.
50 Regent St., Cambridge 40, Mass.

Stop piping corrosion!

You can solve corrosion problems with unplasticized PVC piping — outlasts and costs far less than metal systems for handling many types of corrosive materials. New booklet gives properties and applications of PVC systems, describes PVC pipe fittings and flanges made by Tube Turns Plastics, Inc., the only source for injection molded PVC products. Produced by the exclusive Hendry process, these PVC fittings are considerably stronger than fittings made by conventional processes. Write Tube Turns Plastics, Inc., Dept. PC-12, 2929 Magazine Street, Louisville 11, Kentucky.

TUBE TURNS PLASTICS, INC.
Louisville 11, Kentucky
Call your TUBE TURNS PLASTICS' *Distributor*

MEETINGS & CONVENTIONS

DEC. 10-16—*Nuclear Congress and Atomic Exposition.* Municipal Auditorium, Cleveland. American Institute of Chemical Engineers is the sponsor. Exposition director: Athel F. Denham, Atomic Exposition, 931 Book Bldg., Detroit 26. Concurrently will be held the *Nuclear Engineering and Science Congress,* December 12-16. Engineers Joint Council, 29 W. 39th St., New York 18.

JAN. 16-18—*Compressed Air and Gas Institute.* Grand Hotel, Point Clear, Ala. Headquarters office: 1410 Terminal Tower, Cleveland 13.

JAN. 23-25—*American Society of Heating and Air-Conditioning Engineers, Inc.,* annual meeting. Sheraton-Gibson Hotel, Cincinnati. ASHAE headquarters: 62 Worth St., New York 13.

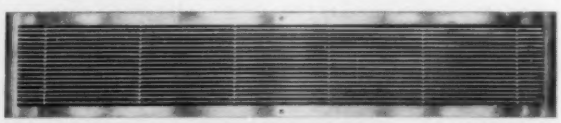
JAN. 23-26—*Seventh National Plant Maintenance & Engineering Show.* Convention Hall, Philadelphia. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

FEB. 6-9—*Fifth Annual Industrial Ventilation Conference.* Kellogg Center, Michigan State University, East Lansing. Jointly sponsored by Michigan Department of Health and MSU. Michigan Department of Health, Lansing 4, Mich.

FEB. 7-9—11*th Annual SPI Reinforced Plastics Division Conference.* Chalfonte-Haddon Hall, Atlantic City. Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36.

FEB. 15-17—*Seventh Annual Corrosion Short Course for Pipeliners.* Mayo Hotel, Tulsa, Okla. Sponsored by Tulsa section, National Association of Corrosion Engineers. General chairman: James C. Bell, 119 W. Eighth St., Tulsa.

MARCH 12-16—12*th Annual Corrosion Conference.* Hotel Statler, New York. Sponsored by National As-



DIAMOND FABRICATED GRILLES
FOR MODERN PUBLIC BUILDINGS

Heating Engineers asked for a stronger, more durable grille — in harmony with the modern trend toward maintenance-free construction in glass, aluminum and steel. Here's our answer: a Custom-Built Heavy-Duty Bar-Type Grille that provides long-needed protection against the trouble and expense so often caused by replacement of light-gauge factory-built air-conditioning grilles. Available in any desired size or shape — all steel or all aluminum. Bulletin 43. Just off the press, gives complete information. Write for free copy.

DIAMOND MANUFACTURING CO. WYOMING (Wilkes-Barre Area) PENNA.

EDWARDS ENGINEERING

Presents a NEW

WATER-SAVING CONDENSER

with these advantages:

- 35% WATER REDUCTION
- 30% COST REDUCTION
- Refrigerant Charge Reduced
- Shipping Weight Reduced
- Cooling Tower Size Reduced
- Capillary Performance Stabilized
- Models from 1 to 7½ Tons Available

Typical Configurations Available

Numerous advantages of this new condenser make it a must for all manufacturers of unitary air conditioning and refrigeration equipment. Applying the highly efficient counter-flow principle of heat transfer, Edwards Engineering Corp. has designed a compact tube-in-tube condenser outstanding in its performance, yet markedly less expensive than conventional condensers.

Reduction of water consumption is achieved by desuperheating of gas by water after condensation and subcooling. Use of coldest water for subcooling results in improved equipment performance. Tube-in-tube design stabilizes capillary performance over varied range of operating conditions.

Use of inexpensive outer tubes reduces cost, improves availability and reduces shipping weights by 4 to 5 lbs. per ton.

Send for Catalog or Call Terhune 5-2808

EDWARDS ENGINEERING CORP.

101 ALEXANDER AVENUE
POMPTON PLAINS, NEW JERSEY

Monarch NOZZLES for AIR WASHERS

These are "non-clogging" nozzles with a single large tangential lead hole to the swirl chamber that will never clog from any impurities small enough to pass through the orifice. Swirl chamber is conical on both ends and pivots liquid like a top to produce an exceptionally fine, evenly distributed, balanced spray of about 80° included angle. Wider spray angles up to 130° can be furnished to order.

Standard material Brass. Also available in Stainless Steel and Monel. Pipe sizes from ⅛" to 1". ¼" size is 1-5/16" long and made from ⅜" square stock.

Write for Catalog 6-A

Monarch MFG. WORKS, INC.
2523 E. ONTARIO ST.
PHILADELPHIA 34, PA.

Canadian Agents: (Except B.C.)
Canadian General Filters Ltd., Toronto 16, Canada

SEVERAL MAN HOURS LOST DAILY ... until a *Delta* OIL UNIT HEATER warmed up this loading platform!

PROBLEM: It was impossible for loaders at this open warehouse platform to work more than short shifts in cold weather.

SOLUTION: A Delta Oil-Fired Unit Heater was installed. It was selected because heat output is high while fuel costs are extremely low. Installed fast and easily moved wherever else needed as the weather gets warmer.

RESULTS: Loaders can now work a full day comfortably in any weather. Number of trucks loaded per day has doubled. Operating costs of the Delta Unit Heater are negligible.

Send for complete new catalog H

This is only one of hundreds of jobs that a Delta OIL Unit Heater can do better and more economically.

DELTA HEATING CORPORATION
TRENTON 8, NEW JERSEY

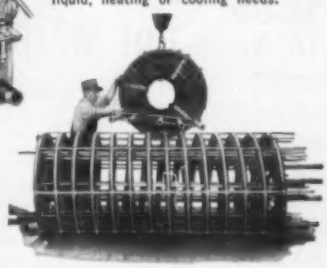
Industry Had Acid Vapor Heating and Cooling Problems

REMPE

Solved Them With...

FIN AND PIPE COILS OF STAINLESS STEEL

Rempe Fin Type Coils are ideally suited for handling all types of corrosive air mixtures, gas or liquid, heating or cooling needs.



We have complete facilities and tested technique in the fabrication, welding and finishing of pipe coils made from all types of stainless steel.

Send details or blueprints for engineering advice and quotations on your requirements, for all types, all materials of pipe and fin coils.

REMPE COMPANY

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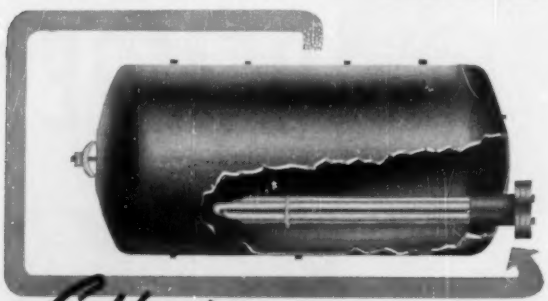
Install BUILDERS SHUNTFLO STEAM METERS right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2" to 14" lines — Model SMDH for 1" and 1½" lines. Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS FEEDERS CONTROLS



Efficiency is a must
in your HOT WATER GENERATOR

TANKS
SMOKESTACKS
PIPING
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BOILERS

Here is a Hot Water Generator that will give you the maximum in efficiency! *More* hot water at *less* operating cost. Quality of constructions is your assurance of the maximum operating efficiency from your FINNIGAN equipment. Adaptable to any type operation—built to your specification in capacities from 66 to 5,000 gallons, FINNIGAN Hot Water Generators are made from the finest material and contain copper removable-coil heating element. They are equipped with large size tappings which can be bushed to fit any job.

Call, wire or write today for further information . . . there is no obligation.

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41 E. 42nd ST., NEW YORK 17, N.Y.

MEETINGS & CONVENTIONS — *Continued*

sociation of Corrosion Engineers, 1061 M & M Bldg., Houston 2.

MARCH 18-21—*American Society of Mechanical Engineers*, spring meeting. Multnomah Hotel, Portland, Ore. ASME headquarters: 29 W. 39th St., New York.

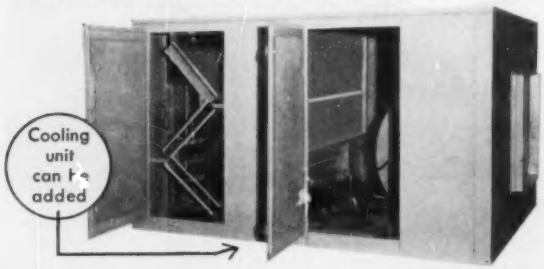
MARCH 21-23—*18th Annual American Power Conference*. Hotel Sherman, Chicago. Sponsored by Illinois Institute of Technology, 35 W. 33rd St., Chicago.

MAY 7-9—*Air Conditioning and Refrigeration Institute*, annual meeting. The Homestead, Hot Springs, Va. ACRI headquarters: 1346 Connecticut Ave., N.W., Washington 6, D.C.

JUNE 18-20—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Shoreham Hotel, Washington, D.C. ASHAE headquarters: 62 Worth St., New York 13.

FEB. 25-*MAR.* 1, 1957—*International Heating & Air-Conditioning Exposition*. International Ampitheater, Chicago. Under auspices of the American Society of Heating and Air-Conditioning Engineers. Management: International Exposition Co., 480 Lexington Ave., New York 17. ∓

The new
KLIMATIC KING
a compact heating, ventilating unit
Ideal for applications where high humidity is a problem



Designed for dairy, food processing and industrial plants. The Klimatic King is fabricated with a corrosion-resistant galvanized steel casing, insulated to eliminate condensation and dripping. Automatic controls for temperature and ventilation. Two speed motor for "high" and "low" production periods, provides maximum economy of operation. These and many other features are standard with the Klimatic King, not "optional extras". The quality leader in its field. Sizes 3,500 to 20,000 CFM.

Architect and dealer inquiries invited. More than fifty years experience is at your disposal. Write today

THE King CO. OF OWATONNA
NORTH WINONA ST. OWATONNA, MINNESOTA
MANUFACTURERS OF SHARP FREEZE, COOLING, VENTILATING AND HEATING SYSTEMS

AIR CONDITIONING ENGINEER

For the unusual man an unusual opportunity exists as manager of Air-Conditioning Product Engineering in the research laboratories of an outstanding multi-plant corporation, a recognized leader with a history of stability. The position is at a Midwestern location. Reporting to the director of research, this individual will be responsible for developing, recommending and supervising the execution of all technical, engineering and laboratory phases of domestic air-conditioning product development and improvement projects and will render air conditioning engineering services to other units of the corporation. He will be responsible for all administrative aspects of the development and day-by-day activity of a group of 24 or more engineering and research personnel.

A successful applicant must have an engineering degree, ten or more years' experience in domestic air-conditioning product development, research and manufacture and an intimate knowledge of specifications, design and performance of presently marketed air-conditioning products.

Compensation is in the low five figures with excellent prospects for financial advancement. Excellent company benefits.

Please submit detailed resume, in confidence, to:

Key 1200A, Heating, Piping & Air Conditioning,
6 North Michigan Avenue, Chicago 2, Illinois

DUST-magnet T.M.
filter is a superior product

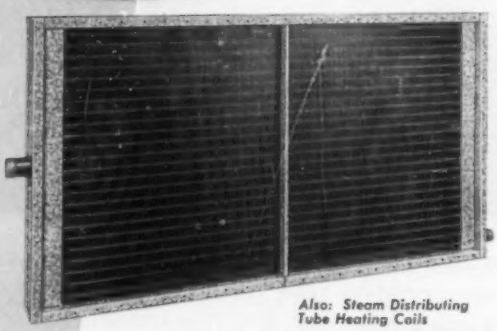
says Albert J. Mattes
General Manager
J. M. Oberc, Inc., Detroit

Mr. Mattes, as general manager of one of Michigan's largest refrigeration and heating equipment jobbers and manufacturers' representatives, carefully analyzes a product and its market before deciding to handle it. Here is what he says about the Dust-magnet filter:
"I chose the Dust-magnet filter because it is truly permanent and easy to clean. It's a superior product, the price is sensible, and the company is reliable and cooperative."

The Dust-magnet electrostatic filter is made of patented woven white plastic installed under spring tension in a galvanite steel frame. Ask for literature.

STODDARD INDUSTRIES, INC.
1545 Kingsbury St., Chicago 22, Illinois

RIGIDBILT
STANDARD STEAM HEATING COILS



Also: Steam Distributing Tube Heating Coils

MAXIMUM HEAT TRANSFER ASSURED!
All tube outlets from header are extruded, providing double thickness for tube insertions. Tubes are fabricated from 0.035" copper, nipple connections are brass, thus assuring strength far longer life with utmost economy.

RIGIDBILT IS BETTER BUILT — Write for Catalog

RIGIDBILT INC.

2850 WEST FULTON BLVD., CHICAGO 12, ILL.

HEATING • AIR CONDITIONING • REFRIGERATION

NOW LOW COST AIR CONDITIONING FOR INDUSTRIAL HOT SPOTS!

Here's the "way out" for those really tough industrial "hot spots" where the equipment in use generates and intensifies the heat. A Polar Breez unit, installed in a hot spot such as this, will drop the temperature a full 20° and more . . . and at a cost well within reach of every business.

For example a Polar Breez 15 ton unit, large enough to cool a room 60' long x 30' wide x 10' high cost your client less than $1000 COMPLETELY INSTALLED . . . operates at less than 5c an hour for electric, water cost $1.00 a year.

Polar Breez Units have been subjected to every conceivable sort of application . . . AND HAVE MET WITH APPROVAL EVERYWHERE. This is our proof — and YOURS — that you can't go wrong when you recommend, sell and install POLAR BREEZ AIR CONDITIONING.

Polar Breez units supply 100% FRESH — COOLED — FILTERED AIR at all times and are IDEAL for taverns — Small restaurants — drug stores — beauty shops — laundries — dry cleaning plants — and All industrial HOT SPOTS.

Polar Breez units are available in sizes of 3 — 5 — 7½ — 10 — 15 and 25 ton equivalent capacity to meet requirements.

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WRITE FOR COMPLETE DETAILS TODAY

AIR COOLING ENGINEERING COMPANY
P.O. Box 744 Evanston, Illinois

Low Silhouette COOK Direct Drive Ventilators

AVAILABLE IN LOW RPM

Cook direct drive ventilators are now available in speeds as low as 490 rpm. You can install a Cook direct drive unit where normally only belt drives are used. Low tip speeds for quiet operation. Light starting torque with aluminum blower wheel. Only 6" high roof curb required. All aluminum construction saves hundreds of pounds roof load on large models. Also available are wall ventilators, and belt drive centrifugal ventilators. Write for Catalog HP. In Canada write to H. F. Clarke Ltd., 244 W. Broadway, Vancouver, B. C.

Lightweight • Spun Aluminum • Rubber Mounting • Easy Installation • Non-overloading Blower Wheel (Aluminum)

COOK VENTILATORS
LOREN COOK COMPANY
Berea, Ohio

These models will be shown in the 1956 SWEET'S FILE

BE Sure with CORNISH

Wired Assemblies

designed . . . developed . . . delivered to COST-ALERT manufacturers

economy quality adaptability

—all figure in your wiring problems. CORNISH specialists, through smartly integrated engineering and production control from rod mill to molding, supply a service of inestimable value to leading manufacturers of Heating and Air Conditioning Equipment.

"MADE BY ENGINEERS FOR ENGINEERS"

CORNISH-RUTLAND CO.
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NEW BOOKS & REPORTS...

RING-JOINT GASKETS AND GROOVES FOR STEEL PIPE FLANGES—ASA B16.20-1955. American Society of Mechanical Engineers, 29 W. 39th St., New York 18. $1.00.

MAN IN COLD ENVIRONMENT, A STUDY IN PHYSIOLOGY. Alaskan Air Command, Arctic Aeromedical Laboratory, Fairbanks. 167 pp. Order PB 111716, Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. $4.25.

ENGINEERING STANDARDS, MULTIPLE V-BELT DRIVES —2nd Ed. 24 pp. Rubber Manufacturers' Association, Inc., 444 Madison Ave., New York 22, *or* Multiple V-Belt Drive & Mechanical Power Transmission Association, 27 E. Monroe St., Chicago 3. $1.00.

PANEL HEATING—Supplement No. 6. Heating, Piping and Air Conditioning Contractors National Association, 30 Rockefeller Plaza, New York 20. $1.50.

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No shut-down shudders here!

As the letter opposite makes clear, the McDonnell Pump Control, illustrated below, is handling a mighty important job in the big, modern Skokie plant of Felt Products Mfg. Co.

Its task is to maintain an adequate water level in the fast-steaming Mears-Kane-O'Feldt Boiler on which it is installed. This boiler supplies process steam at pressures up to 200 psi. to molds used for pressing gaskets . . . so a boiler failure could be ruinous to gasket production.

This is the kind of job the new McDonnell No. 92 Pump Control, Low Water Cut-off and Alarm was built to do — the kind of job it is doing supremely well as brought out in the letter from Mr. Turner of Felt Products Mfg. Co.

Never forget that low water strikes its deadly blows without warning. So only the best boiler water level control is good enough to safeguard *your* boiler. In the new McDonnell 92 Series you have the best that care and experience can produce for higher pressure applications like this . . . and there is a McDonnell control for every application and pressure up to 250 psi. Read the facts about the new 92 Series and ask for bulletin L-119 that tells the entire story.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

FELT PRODUCTS MANUFACTURING COMPANY

Skokie, Ill.
Aug. 12, 1955

McDonnell & Miller, Inc.
3500 N. Spaulding Ave.
Chicago 18, Ill.

Attention: Mr. Fred Rohe

Dear Mr. Rohe:

We are highly pleased with the positive operation of your McDonnell No. 92 Hi-Pressure Controller on our Mears-Kane-O'Feldt Boiler.

As you know, the continuous operation of this boiler is vital to our manufacturing operations as the live steam from it, up to 200 psi., is used to heat molds for pressing gaskets which we make.

Your controller appears to be all that can be asked for in quality and advanced design. We believe it is as fool proof and service free as a piece of equipment can be.

We also appreciate your care in checking our requirements and making sure the controller is correctly installed and giving good service.

Sincerely,

Hiram F. Turner

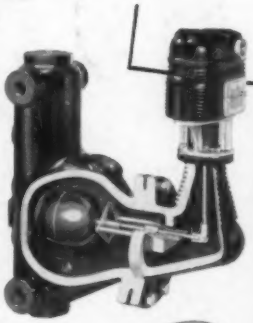
Hiram F. Turner

New product of "Doing One Thing Well"

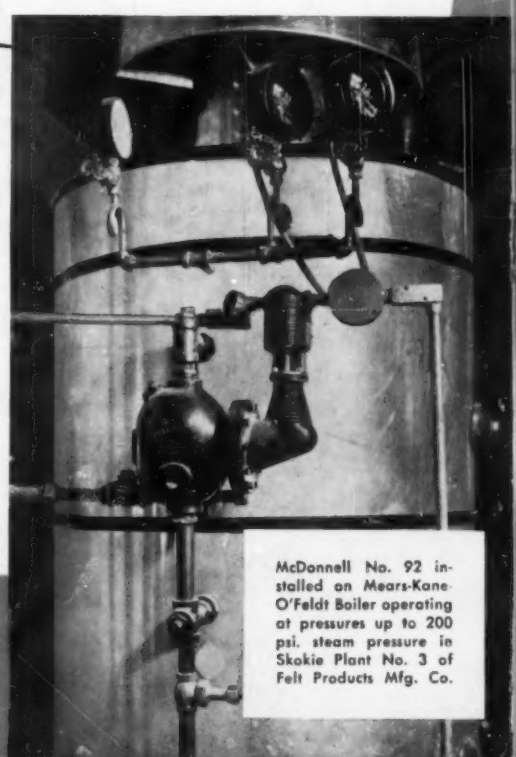
A pump control, low water cut-off and alarm for steam *pressures up to 250 lbs.*

Out of long experience with Alnico magnets as applied to electrical switches has come a new principle in magnetic switching used for the first time in the McDonnell No. 92 Pump Control, Low Water Fuel Cut-off and Low Water Alarm. Unlike other magnetic switches, those used in the No. 92 series operate on *repulsion — not attraction* — giving a powerful and positive action in both opening and closing.

This new principle is found in a control that has been designed throughout to provide a new measure of dependability. Notice the generous float chamber and deep sediment chamber . . . little possibility of interference with float operation here! Float arm fulcrums on flat Beryllium springs assuring accurate alignment and minimum friction—another advancement. A typical refinement is a "Teflon" sleeve on the coupling to the switch rod. "Teflon" is made to order for this difficult assignment. Remarkable dissipation of heat is accomplished between float chamber and switches. The drop (to 167°F.) complies with *current* Underwriters' standards — a remarkable accomplishment. The control is also made with integral water column (No. 192) which cuts installation costs. Ask for data showing how easily and economically this control can be applied to your boiler.



Your Jobber Stocks Them



McDonnell No. 92 installed on Mears-Kane-O'Feldt Boiler operating at pressures up to 200 psi. steam pressure in Skokie Plant No. 3 of Felt Products Mfg. Co.

McDONNELL *Boiler Water Level Controls*